American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

APRIL 22, 1957 PRICE 50 CENTS

Does Plant Air-Conditioning Pay? PAGE 121

Safe Loads for Crane Lifts PAGE 129

Shackle balances off-center crane lift — see page 2

How to get TOP PRECISION PRODUCTION from your Heald Bore-Matics

Sharpen your tools with Heald Precision on a Model 3 Tool Sharpener

HERE, in the plant of a large and progressive automotive manufacturer, is a "production line" for producing *precision production!* These Heald Model 3 Tool Sharpeners serve the cutting tools for a host of Heald Bore-Matics and other precision finishing machines throughout the plant.

By replacing obsolete offhand grinding methods with *machine precision*, any required tool shape can be exactly duplicated again and again. More precisely ground and *sharper* tools not only last longer — they enable you to get top precision and full production from your Heald Bore-Matics, too. After all, it's the *tool* that does the *work!* For complete information, send for Bulletin No. 2-4-2, Issue 1.

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HEALD

American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

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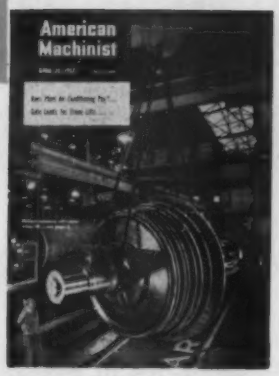
American Machinist *Chips*



Cover . . .
An off-center lift in the Allis-Chalmers shops is shown in a picture taken by Michael Durante. Details on this lift will be found at left.

Safe Lifts . . . Many crane lifts depart from routine by involving parts of odd shape or off-center weight distribution. The 65-ton partially bladed spindle for a 300,000-kw steam turbine-generator units shown on our cover is being moved to a heavy-duty lathe for the machining of blade shrouds. Because it is an off-center lift, a shackle is used to lengthen one sling for balance. The crane is a 100-ton unit.

Such unbalanced loads are commonplace at Allis-Chalmers and over the years this company has developed safety procedures and safe-load tables to assure proper hitches for hoisting operations. M F Biancardi, manager, Safety Services, Allis-Chalmers, describes the techniques in the article starting on page 129. To supplement this, we are starting a series of Reference Book Sheets on the safe-load tables developed at A-C on page 163. This concern with an oft-neglected aspect of materials handling is also to remind you that the 7th National Materials Handling Show will be held in Philadelphia April 29 to May 3. You'll find much of the *new* equipment being introduced at that show described in our new equipment section on page 180.

Good Supervision . . . If there is one key to efficient operation of a metalworking plant it is probably efficient supervision. Good supervisors with a cost-conscious eye cast on all your operations will go a long way toward getting efficiency in all the other key aspects of production. Therefore, the first in our series of follow-up articles to the Special Report on "Modern Management for the Small Plant" (*AM*—Feb 25 '57, p129), deals with the methods of getting effective supervision. It starts on page 148.

Coming . . . *AM* for May 6 will feature an analysis of "What's holding back the automatic assembly machine?" You will find articles on the spacing of gear teeth, on grinding fluids for belt grinding, on some setups for electrical-discharge machining, the welding of heavy stainless, and a succession of die ideas for piercing holes in rings.

Ernest J Urbas . . . is director and superintendent of tools, dies, and engineering at The Guarantee Specialty Mfg Co, Cleveland. He acquired his education by many years of night work at Fenn and Cleveland College. The know-how he has accumulated in 29 years with Guarantee Specialty has made him a recognized authority on die and stamping problems, with a bold and yet common-sense technique. Recently he won the 1957 John Woodman Higgins Redesign Award for the original conversion of a screw machine part into a pressed form. He describes this winning die design in the article on page 138.

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SPIRAL BEVEL GEAR

HYPOID PINION

How to produce both with just *one* cutter, *one* machine

These two parts alone show why the Unitool* Method is ideal for economical job shop operation, for trying new ratios, and for producing prototypes.

You need only one machine—either the No. 116 Hypoid Generator or the smaller No. 106—and one cutter to produce both parts.

You complete both parts from the solid before removing them from the machine.

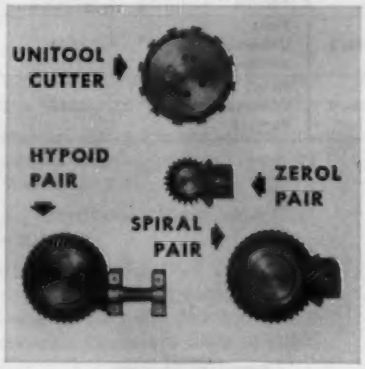
Add just five more cutters and you are equipped to produce spiral bevel and Zerol® bevel pairs of any ratio, and hypoid pairs of 3:1 ratio and higher. You can cut any of these gears up to 18″ pitch diameter.

*Trademark

No special training needed The operator uses direct common sense methods to set for the correct tooth thickness and position of contact. No lengthy, expensive training is necessary.

Fast change-overs You can switch to different sizes or types of gears in minutes. A calculated set-over is all it takes to get the right gear size. No other measurements are necessary.

Bulletins—Write for bulletins on the Unitool Method and the two generators which outline all the advantages of the method and explain its operation in detail.



With the Unitool Method you use just one cutter to produce the three types of gear pairs shown here. Such versatility cuts costs sharply on small-lot production.

GLEASON WORKS

Builders of bevel gear machinery for over 90 years

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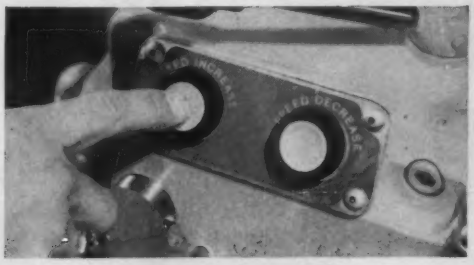
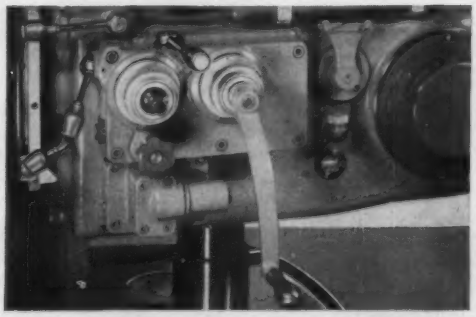
Dial Type Operating

help the operator improve his performance



Push-button selection of spindle speeds

Power selection of feeds, ⅜ to 90 ipm



Rear operating controls are duplicates of those located at the front of the machine. (Plain and Universal styles)

Identification disks on all control levers

DIAL TYPE LINE		table traverse	main drive	automatic table cycles available
No. 2	Plain	28"	10 hp	yes
	Universal			no
	Vertical			yes
No. 3	Plain	34"	15 hp	yes
	Universal			no
	Vertical			yes
No. 4	Plain	42"	20 hp	yes
	Universal			no
	Vertical			yes

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MILLING MACHINES • BROACHING MACHINES • CUTTER AND TOOL GRINDERS • METAL FORMING MACHINES

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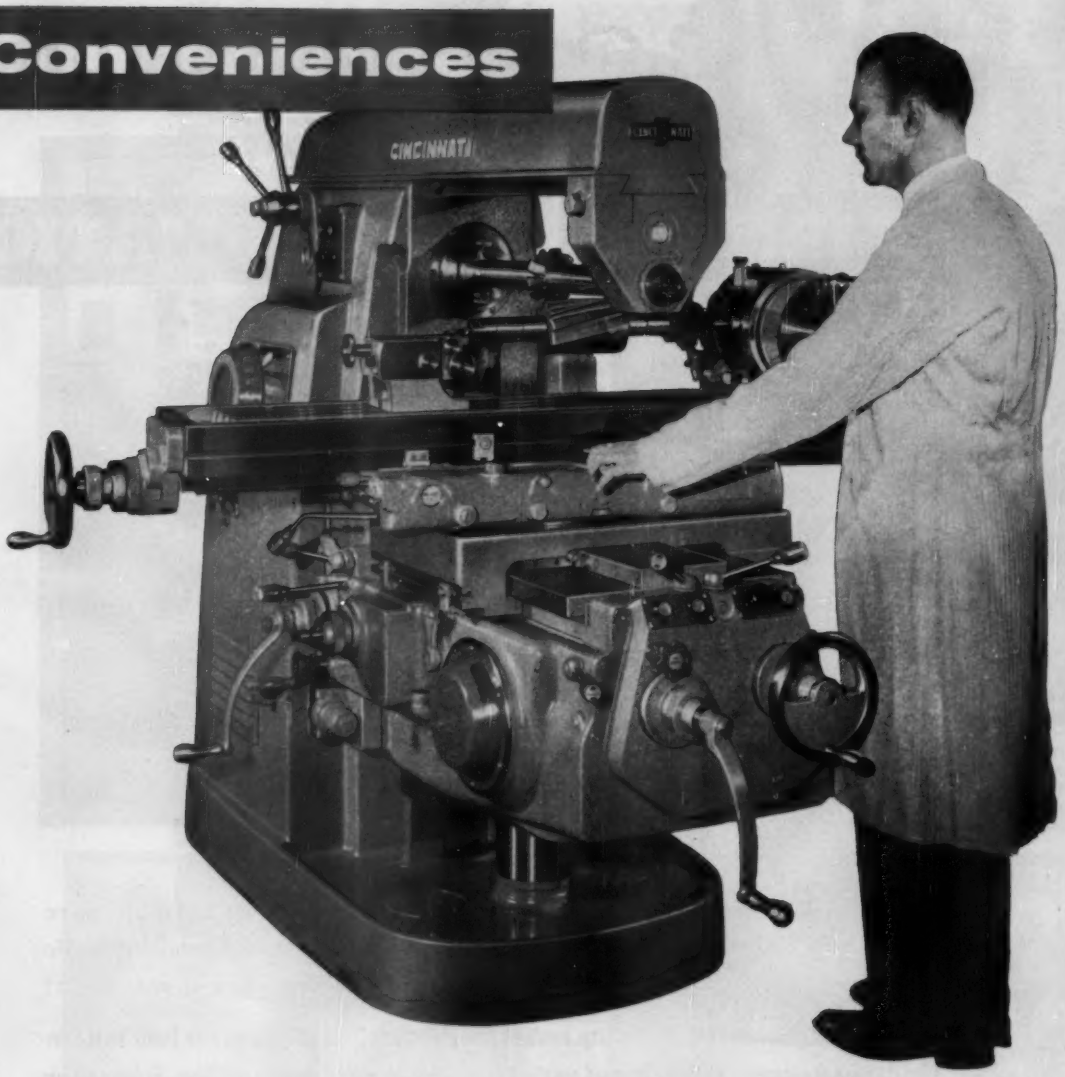
Conveniences



Ask the man at the machine. He'll tell you that built-in operating conveniences have a direct tie-in with costs. For example, consider a much appreciated Dial Type convenience like identification disks on control knobs. They jog the operator's memory; help him avoid wrecks between the cutter and work or fixture. Other CINCINNATI® Dial Type operating conveniences include:

Push-button selection of spindle speeds: in increasing or decreasing steps

Power feed change: in increasing or decreasing steps

Independent, directional controls: with palm-fitting plastic knobs

Dynapoise chatter-damping overarm: greatly reduces the noise of cutting action

Safe to operate: all hand cranks automatically disengaged when power feed or rapid traverse is engaged

Complete rear controls (Plain and Universal machines)

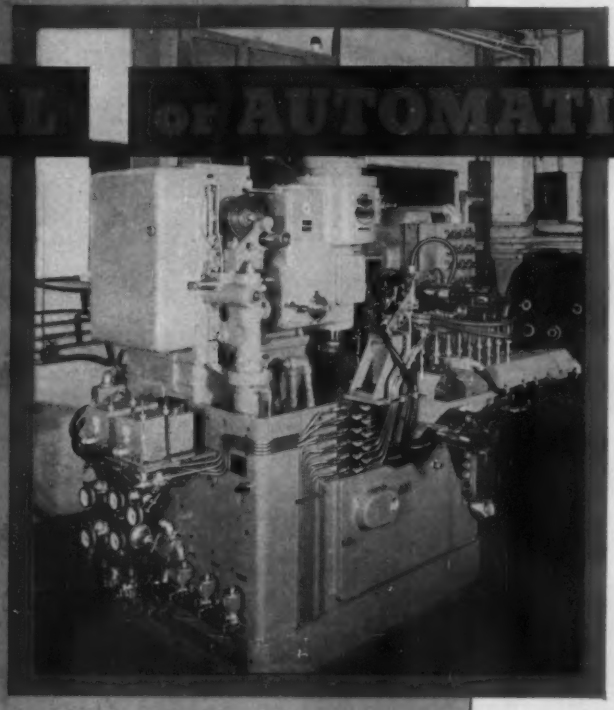
These are but a few reasons why Dial Type Milling Machines are tops with the operator. Want more information? Look in Sweet's Machine Tool File for brief specifications; complete data in catalog No. M-1915-2.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID • GRINDING WHEELS

VERSATILE

MANUAL or AUTOMATIC



Practically any shaped part in its size range can be cut faster and more accurately on a Fellows No. 4GS Gear Shaper . . . with either manual, semi-automatic or full-automatic operation, depending on your needs!

This production flexibility makes the powerful "4GS" ideal for long runs on similar parts or for short runs of varied jobs. Set-ups are easy and fast. Internal or external spur and helical gears, as well as splines, cams and other irregular non-involute shapes up to 6" P.D. and 2" face width can be cut on this machine. Nine cutter speeds range from 98 to 635 strokes per minute.

The versatility of Fellows No. 4GS Gear Shaper, with manual operation or any degree of automation, can very probably lower *your* cutting costs. Ask your Fellows Representative to show you facts and figures. Write, wire or phone any Fellows office.

THE FELLOWS GEAR SHAPER COMPANY
78 River Street, Springfield, Vermont
Branch Offices:
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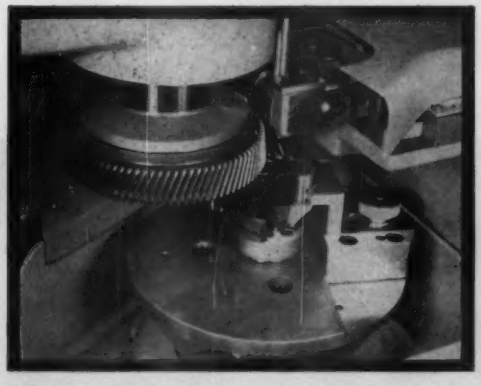
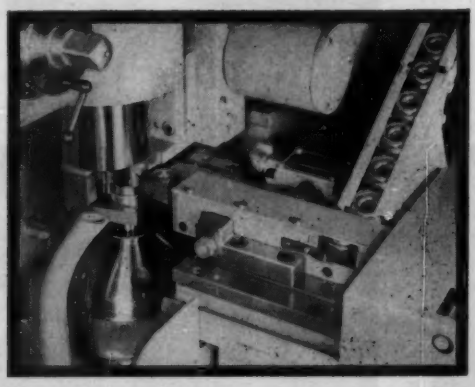
THE PRECISION LINE

FELLOWS "4GS"

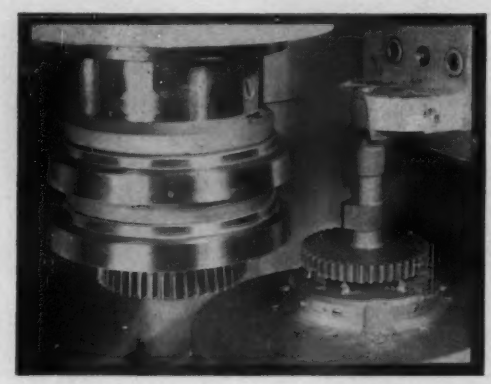
...or anything in between!



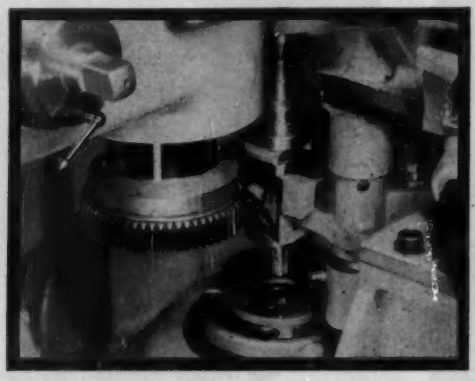
Helical gear cut on a motor crankshaft. Operation can be manual or semi-automatic. Part is held in a bushing at the bottom, an air operated split sleeve support at the top and driven from the connecting rod bearing surface.



Internal clutch parts produced with fully automatic loading and unloading. Part is transferred from loading chute to air operated expanding arbor and teeth are cut. Part is then removed from arbor and transferred to unloading chute while another blank is being loaded.



Two cams and a gear are cut at the same time on this gasoline motor part. Cutters are used in tandem and are keyed together to give the required relation between the positions of the cams and the teeth of the concentric gear. Operation is manual.

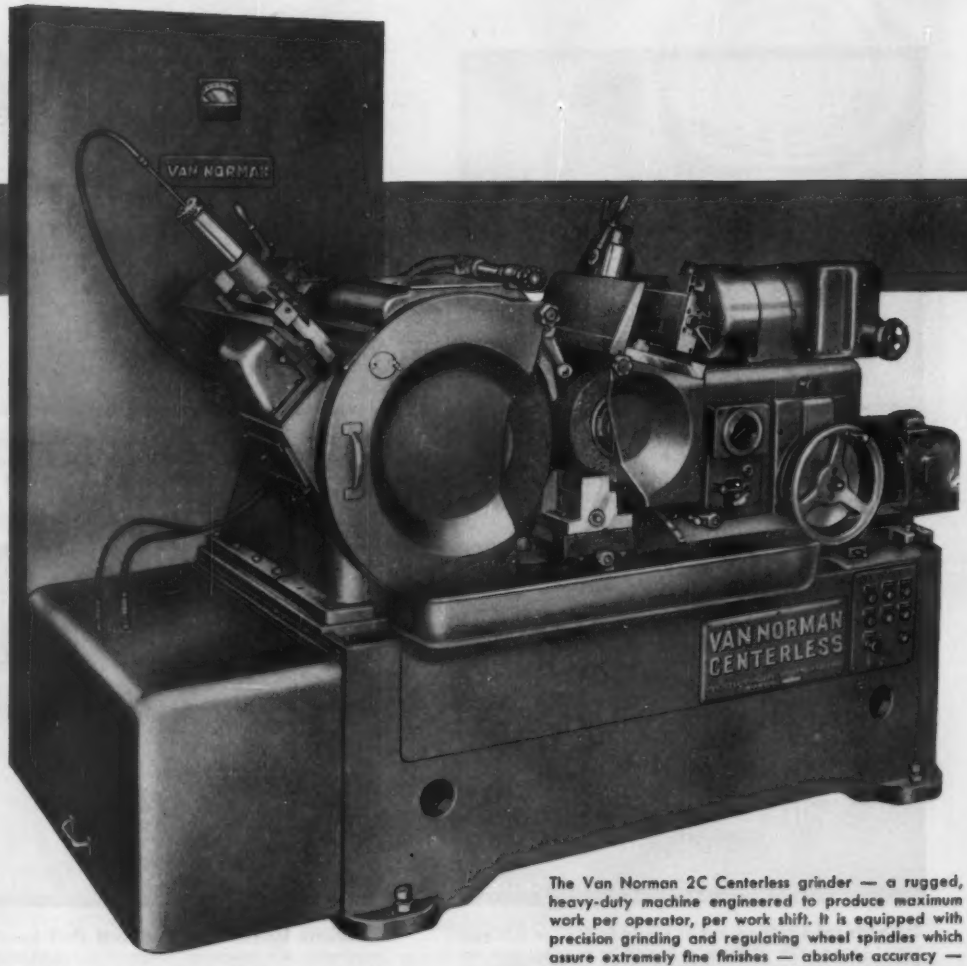


Automotive transmission cluster gear shaft handled automatically. Air operated "fingers" move shaft into position for automatic chucking and then place finished part in unloading conveyor.

Fellows *Gear Production Equipment*

VAN NORMAN

Centerless



The Van Norman 2C Centerless grinder — a rugged, heavy-duty machine engineered to produce maximum work per operator, per work shift. It is equipped with precision grinding and regulating wheel spindles which assure extremely fine finishes — absolute accuracy — and provide chatterless trouble-free operation.

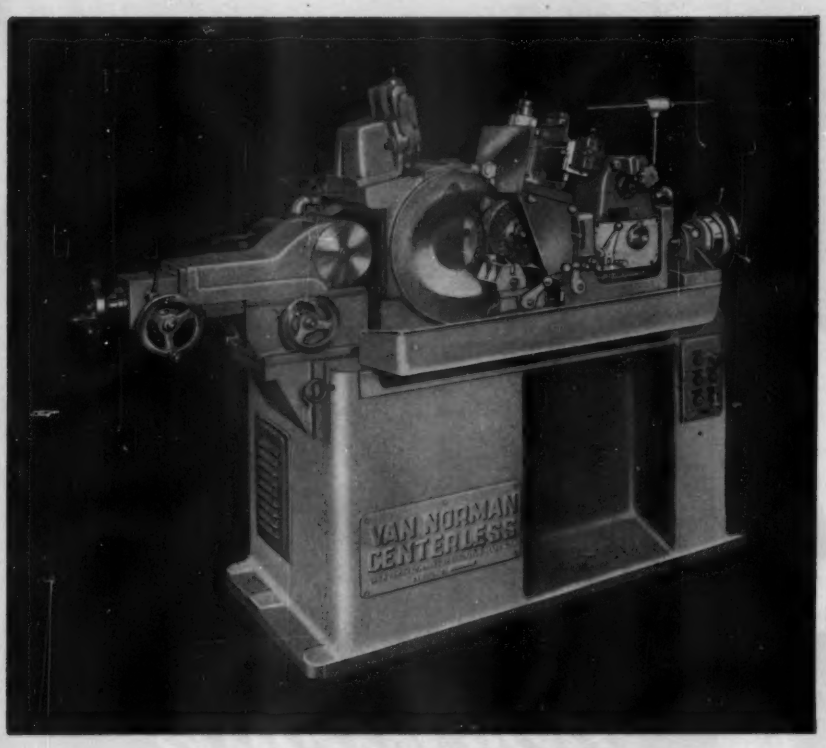
VAN NORMAN MACHINE

a division of Van Norman Industries, Inc.

MANUFACTURERS of—Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

Grinders

Precision Grind Parts Fast, Economically, To Close Tolerances



The Van Norman 1C Centerless grinder — finish grinds some small parts from solid . . . or finish grinds rough-turned parts. The 1C is especially suited for grinding parts used in business and office machines, sewing machines, electrical appliances, aircraft, automobiles, munitions and similar work.

Van Norman Centerless grinders are precision-manufactured to produce a wide variety of parts made of metal, wood, fibre, plastic or glass. Actually these Van Norman Centerless grinders are three machines in one . . . will handle thru-feed work, in-feed work and — equipped with a Crush Dressing Attachment — form grinding and profile work. Get complete details on the Van Norman 1C and 2C Centerless grinders. Write, wire or telephone for catalog.

COMPANY
SPRINGFIELD 7, MASSACHUSETTS

Don't wait . . . for extra profit install a Van Norman machine now! They are available in many purchase plans . . . Outright sale . . . Purchase on conditional sales contract up to five years . . . Pay as you depreciate up to 10 years.

Fig. 1

4 feet of thread *per minute*

with the LANHYROL thread rolling machine

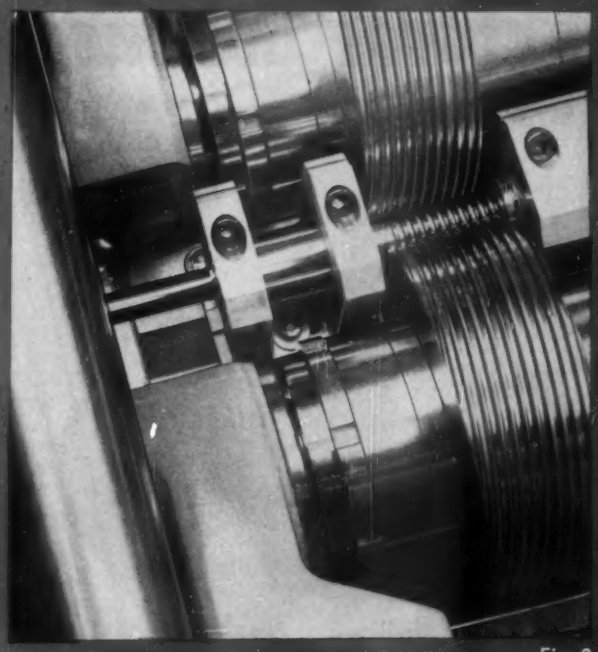


Fig. 2

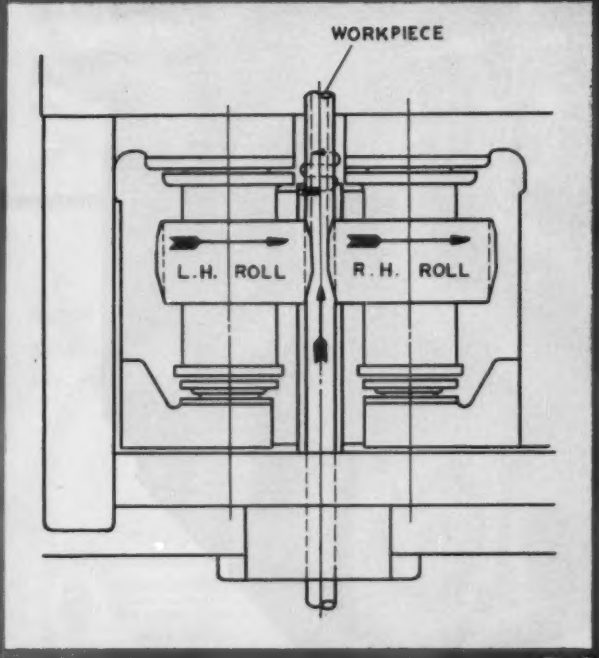


Fig. 3

The LANHYROL Thread Rolling Machine has shown outstanding results in output and thread quality producing ¾" jack screws at the M & S Manufacturing Company in Hudson, Michigan.

20-foot bar lengths of C1117 steel are being formed by Thrufeed Rolling at the rate of 48 linear inches per minute. The ¾"—6 pitch left-hand Acme threads are held within .001" on the pitch diameter throughout the entire bar length. Over 59,000 feet of thread have been produced with a set of roll dies.

Thrufeed Rolling is designed for workpieces requiring threads on the maximum diameter only or for headed parts with over 5⅞" of thread length. In this application, the workpiece is placed in a feeding tube which is halved for loading convenience (Figure 1). It is then passed axially into ball-bearing work supports and between the rolls (Figure 2). Rolls with a throat section for progressive generation of the thread provide a self-leading action as the threads are formed (Figure 3). Operation is continuous, with rolls revolving at correct fixed center distance. The right-hand roll unit may be retracted at anytime for set-up adjustment or stock removal.

The LANHYROL Machine also produces quality threads at high rates of output by the Infeed and Continuous rolling methods. Its range and flexibility is so great that we recommend your consideration of this equipment for any job requiring precision threads of excellent finish at high production rates. Please send specifications and ask for Bulletin E-60.

LANDIS *Machine* COMPANY
WAYNESBORO · PENNSYLVANIA

485C

Exclusive Landis features increase

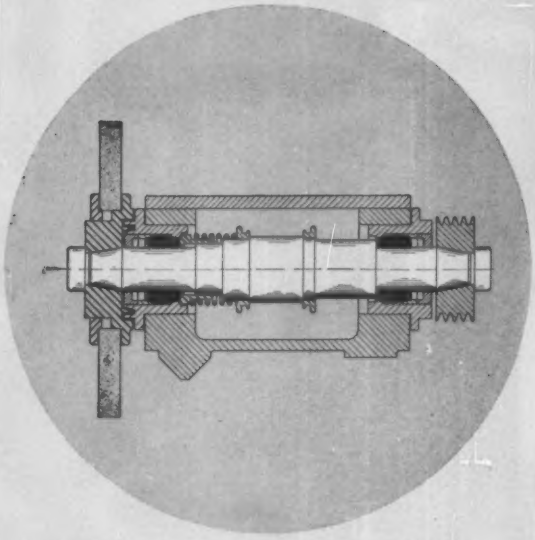
Landis 6" x 18" Type CH Plain Hydraulic Grinder

LANDIS

precision grinders

LANDIS TOOL COMPANY / WAYNESBORO, PENNSYLVANIA

grinder output

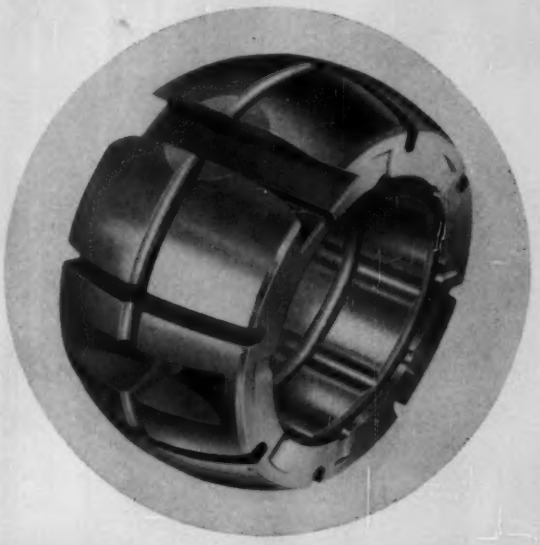


Landis heavy duty wheel spindle

Extra rigidity for fine finishes, higher production from exclusive Landis spindle design with increased diameter between microsphere bearings.

Landis microsphere spindle bearings

Extremely close running clearance of spindle bearing gives fast sparkout and sensitive response to wheel feed. Rigid, one-piece construction for heavier cuts to close tolerances.



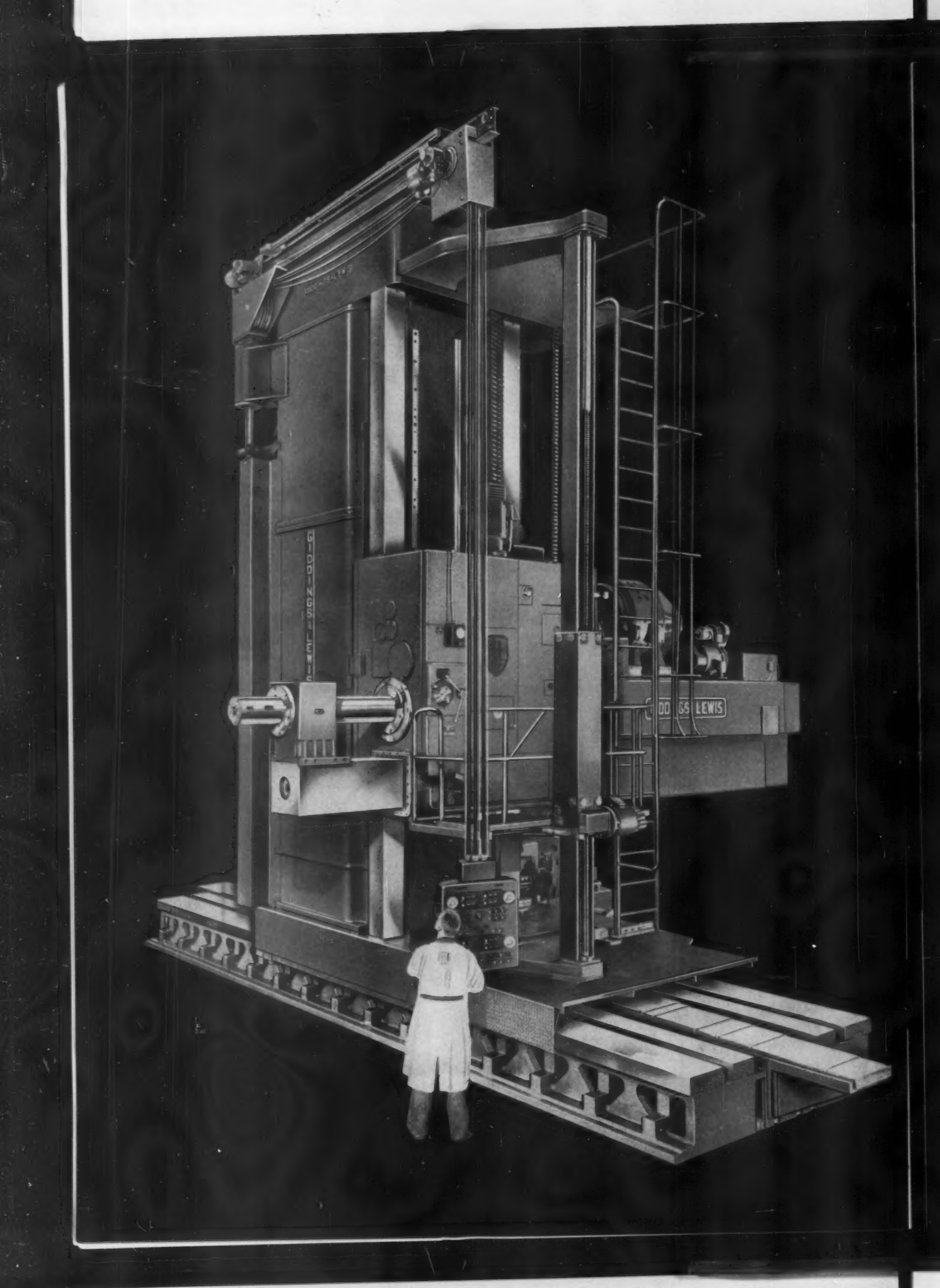
made in 4 sizes

Suitable for traverse or infeed grinding of medium size work parts on long or short production runs.

condensed specifications	6" type CH plain	10" type LCH plain
Maximum diameter work swing	6⅝"	10¾"
Lengths between centers	18" or 30"	18" or 30"
Standard grinding wheel diameter	24"	24"
Wheel drive motor	7½ hp	7½ hp
Net weight—30" machine	6500 lbs.	6600 lbs.

Landis eye-level wheel feed

Location of grinding wheel feed handwheel permits operator to see both grinding operation and handwheel graduations from normal working position. Easier, more accurate operation saves time.


LEWIS

GIDDINGS & LEWIS

(MODEL 1210-FUAR)

World's largest horizontal boring, drilling and milling machine with underarm spindle support

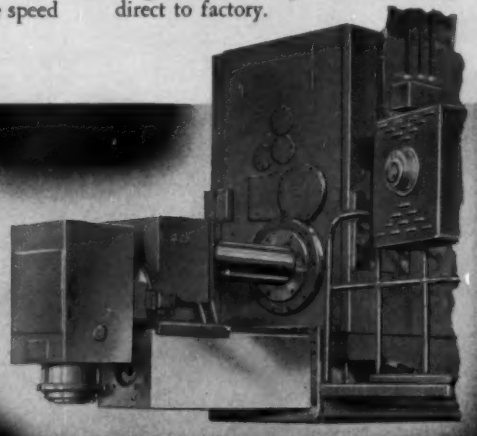
How many times have you said: "We could bore, face and mill *huge workpieces* faster, better and at a profit if we only had a bigger horizontal." The answer to this problem is the new G&L Model 1210-FUAR (floor-type) with 10-inch diameter spindle and 18-inch square underarm — *the world's largest.*

Incorporated in the Model 1210-FUAR are many of the outstanding and proven design features of G&L's broad line of horizontal machines. Weighing over 220 tons, the 1210-FUAR is 27-ft. high. All welded steel construction contributes to extreme machine rigidity. The 42-ton headstock and underarm are arranged for mounting a spindle support and a 2-ton, 90° angular milling attachment.

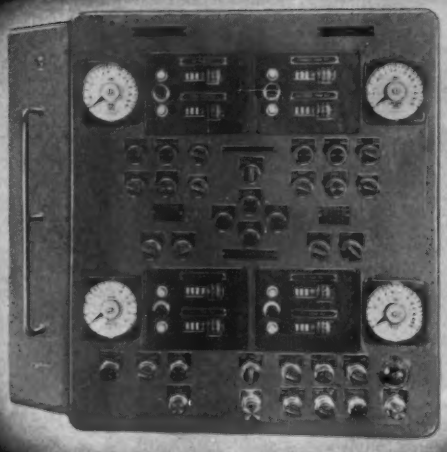
The 1210-FUAR has an overall spindle speed range of 1.5 to 400 rpm . . . two ranges of .002 to .5 ipm and .5 to 120 ipm feed and traverse to spindle and underarm . . . milling feeds to column and headstock from .5 to 120 ipm over four gear ranges. Other operating features include: independent control of headstock and column, remote feed range selection, readout measuring device (optional) for positioning headstock, spindle underarm and column to .001"

G&L's 1200 Series horizontals are available with 10, 12 and 14-inch diameter spindles, powered by 100 or 150-hp motors. They can be furnished with vertical headstock and horizontal column travel to any desired specifications.

For complete specifications, contact your Giddings & Lewis representative today, or write direct to factory.



2-ton 90° angular milling attachment

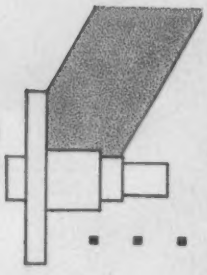


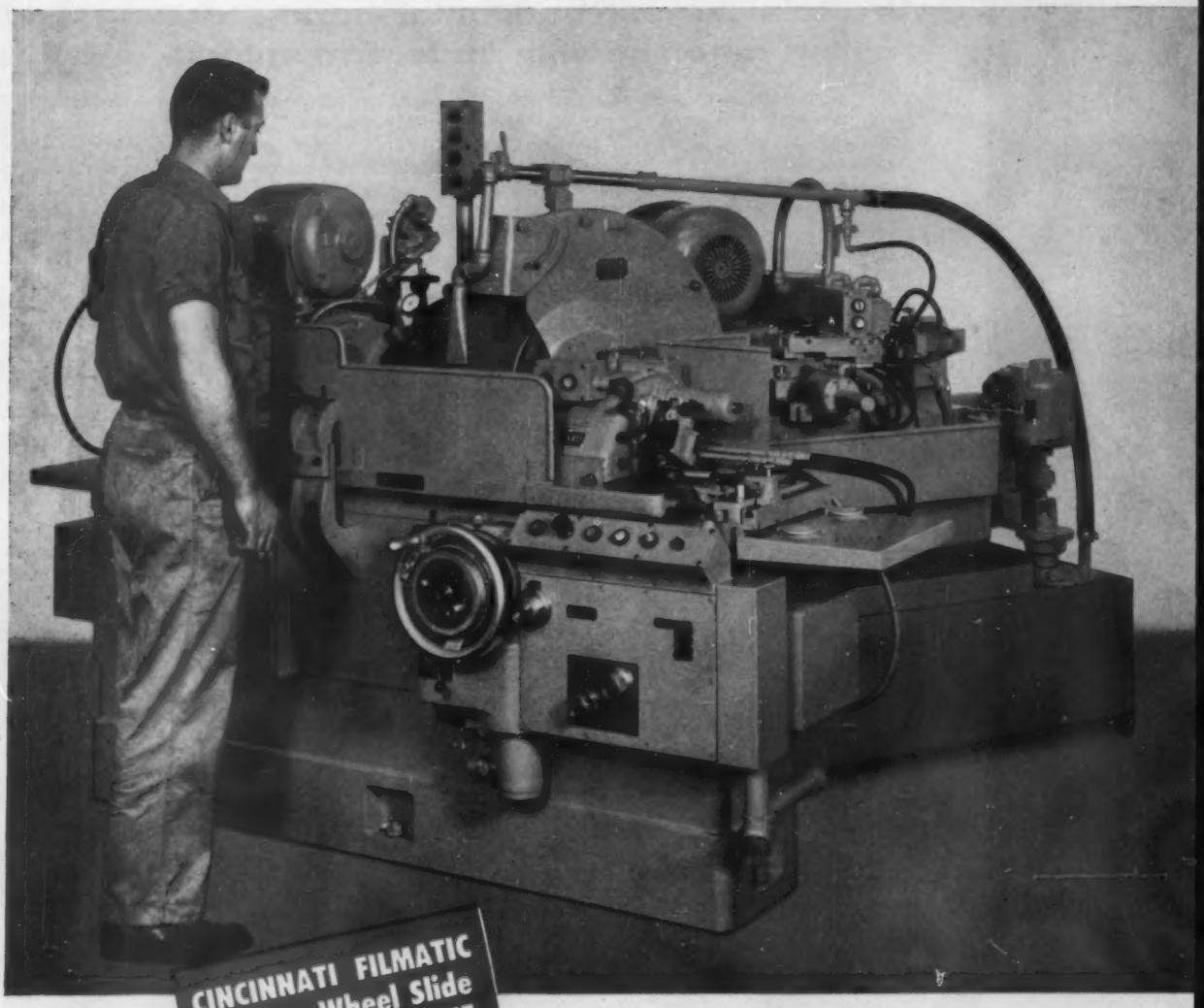
Power-operated push button pendant control

G & L *and* HYPRO DIVISION
GIDDINGS & LEWIS MACHINE TOOL CO.
FOND DU LAC, WISCONSIN G-74

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; HYPRO Double Housing and Openside Planers; Planer-Type Milling Machines; Vertical Boring Mills; Spar and Skin Milling Machines, and VARIAX Milling Machines.

It Pays to Combine





CINCINNATI FILMATIC Angular Wheel Slide GRINDING MACHINE

Diameters and adjacent radii and shoulders are precision ground in one operation on this CINCINNATI FILMATIC 10″R x 18″ Angular Wheel Slide Grinder. Sizes available: 6″R and 10″L x 18″ or 30″ between centers; 10″R and 14″L x 18″ to 72″ between centers.

CINCINNATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES • ROLL GRINDING MACHINES • SURFACE

Precision Grinding Operations

Especially on a CINCINNATI Built for the Job

Time, effort and dollars are saved when operations are combined. And quite often quality improves, just as it does when diameters and adjacent radii and shoulders are ground in one operation on CINCINNATI® FILMATIC Angular Wheel Slide Grinding Machines. These fine precision grinders are built for high production work at the lowest cost of any equipment available today. Many features contribute to this outstanding performance. Four are illustrated at the right. Others include:

Push-button automatic grinding cycle, incorporating coarse and fine feed rates for maximum production and high-quality finish.

Roll-out cutting fluid tank. Cuts down service attention.

***Automatic air-electric gage sizing** with cycle time stabilizer. High degree of accuracy and compensation for wheel wear obtained automatically.

***Automatic gap eliminator.** A timesaver where stock allowance varies widely.

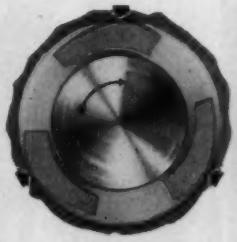
***Behind-the-wheel profile truing equipment,** for automatic, accurate profile truing in both directions.

Additional features and their advantages are illustrated and described in catalog No. G-686. Everyone concerned with modern precision grinding methods and low costs should have a copy. May we hear from you? Meanwhile you might want to look at the brief specifications in Sweet's.

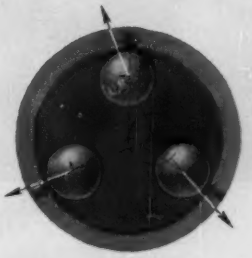
**Available at extra cost.*

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

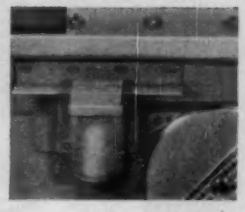
FILMATIC



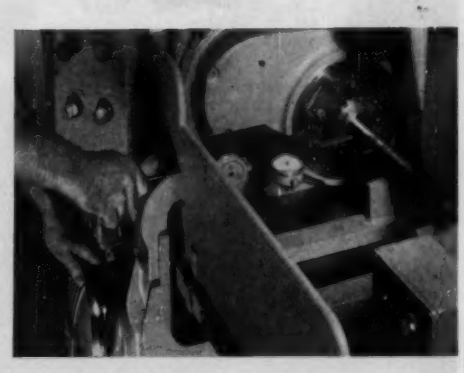
FILMATIC grinding wheel spindle bearings, exclusively CINCINNATI, have never been equalled by any other spindle bearing mounting.



Automatic grinding wheel balancing, an exclusive CINCINNATI feature, balances the wheel and mount within a few seconds.

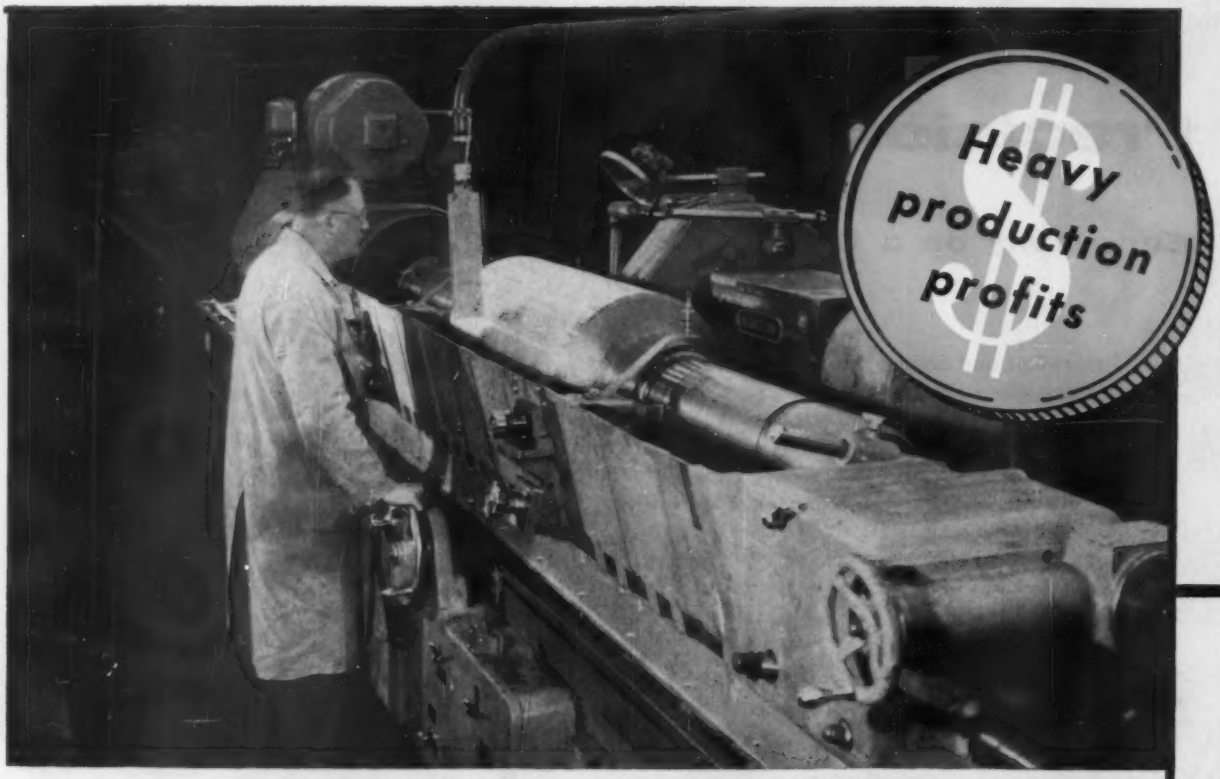


Automatic hydraulic table clamp automatically locks the machine table in position during the grinding cycle.



Manual flagging device, for locating the work axially with respect to the wheels, is simple and accurate. Automatic flagging device is also available.

GRINDING MACHINES • CHUCKING GRINDERS • MICRO-CENTRIC GRINDING MACHINES • CENTERLESS LAPPING MACHINES



C-2 AS A ROLL GRINDER for straight, convex, or concaved rolls.

C-2 PLAIN for lowest cost traverse grinding.

C-2 AS A SEMIAUTOMATIC for effortless plunge grinding.

Heavy duty cost cutter —the big Norton C-2

The Big Norton C-2 Cylindrical Grinder removes stock like a steam shovel and handles as easy as your '57 car. It gives you the Norton "Touch of Gold" on massive grinding jobs — large motor and turbine shafts, lathe and drilling machine spindles, radial mill columns, boring bars and the like.

With smooth, abundant power and a rigidly-ribbed base, the C-2 handles work lengths to 240″ and diameters to 24″.

It cuts production costs because it sets up quickly and keeps downtime to a minimum.

You can have the C-2 in three arrangements — *plain, semi-automatic, or roll.*

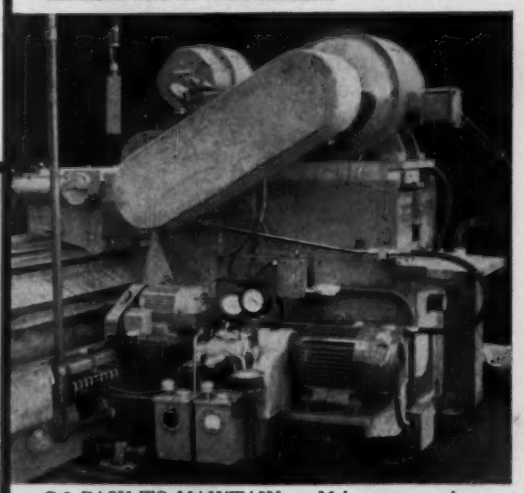
It is built in three swings of 14″, 18″ and 24″. The 14″, in lengths from 36″ to 168″. The 18″ and 24″, in lengths from 48″ to 240″.

If you use the C-2 semiautomatically, all your operator does is move a single lever for grinding repetitively to exact size and finish.

If you use the C-2 as a roll grinder, the Norton tilting wheel head crowning mechanism comes with it. This mechanism moves the grinding wheel contact point away from or toward the axis of the roll as the roll is moved past the wheel face and is cam and gear controlled to produce any crown desired.

Remember: only Norton offers you such long experience in both grinding machines and grinding wheels to help you produce more at lower cost. For further facts, see your Norton Representative, or write to NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

C-2 SETS UP QUICKLY — All controls in front. No reaching by operator. Click count wheel feed index eliminates need for visual attention.



C-2 EASY TO MAINTAIN — Maintenance points on outside of base.

To Economize, Modernize with NEW

NORTON

GRINDERS and LAPPERS

Making better products . . . to make your products better

District Offices: Worcester • Hartford • Cleveland • Chicago • Detroit
In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5

NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING PRODUCTS: Coated Abrasives • Sharpening Stones • Behr-cut Tapes

NEW

Data-Readout Counter

Provides 100,000 Distinct Circuit Arrangements

Electrically actuated data readout counter with electric reset. Form B-1538 for 110V AC/DC.

FUNCTIONS

Analog to Digital Conversion
Serial or Parallel Circuit Transmission
Continuous or On Demand Electrical Readout
Continuous Visual Readout
Visual and Electrical Data Storage
Predetermining
Repeat Predetermining
Sequential Programming

Veeder-Root's new series of Data Readout Counters combines visual indication with electrical readout for remote indication, recording, and controlling applications. *Electrically* or *mechanically* driven and provided with *manual* or *electric* reset, these counters present a positive display of accumulated totals and automatically create specific control circuit contact closures for each number visually displayed. Each instrument, with its five figure capacity, provides 100,000 distinct circuit arrangements which lend themselves to the most exacting control and transmission requirements. The counters are compatible with standard data processing equipment and offer a wide variety of applications in the industrial control and data processing fields.

Veeder-Root Inc.

"THE NAME THAT COUNTS"

Hartford, Conn. • Greenville, S. C. • Chicago • New York • Los Angeles
San Francisco • Montreal • *Offices and Agents in Principal Cities*

Versatility and quicker setups cut grinding costs for toolrooms and short run production

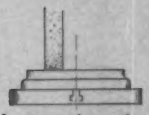
Landis 10" x 20" and 10" x 24" Universal Cylindrical Grinders feature Microsphere Wheel Spindle Bearings for maximum accuracy, high finishes and dependable operation.

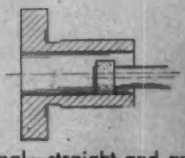
LANDIS
precision grinders
LANDIS TOOL COMPANY / WAYNESBORO, PENNA.

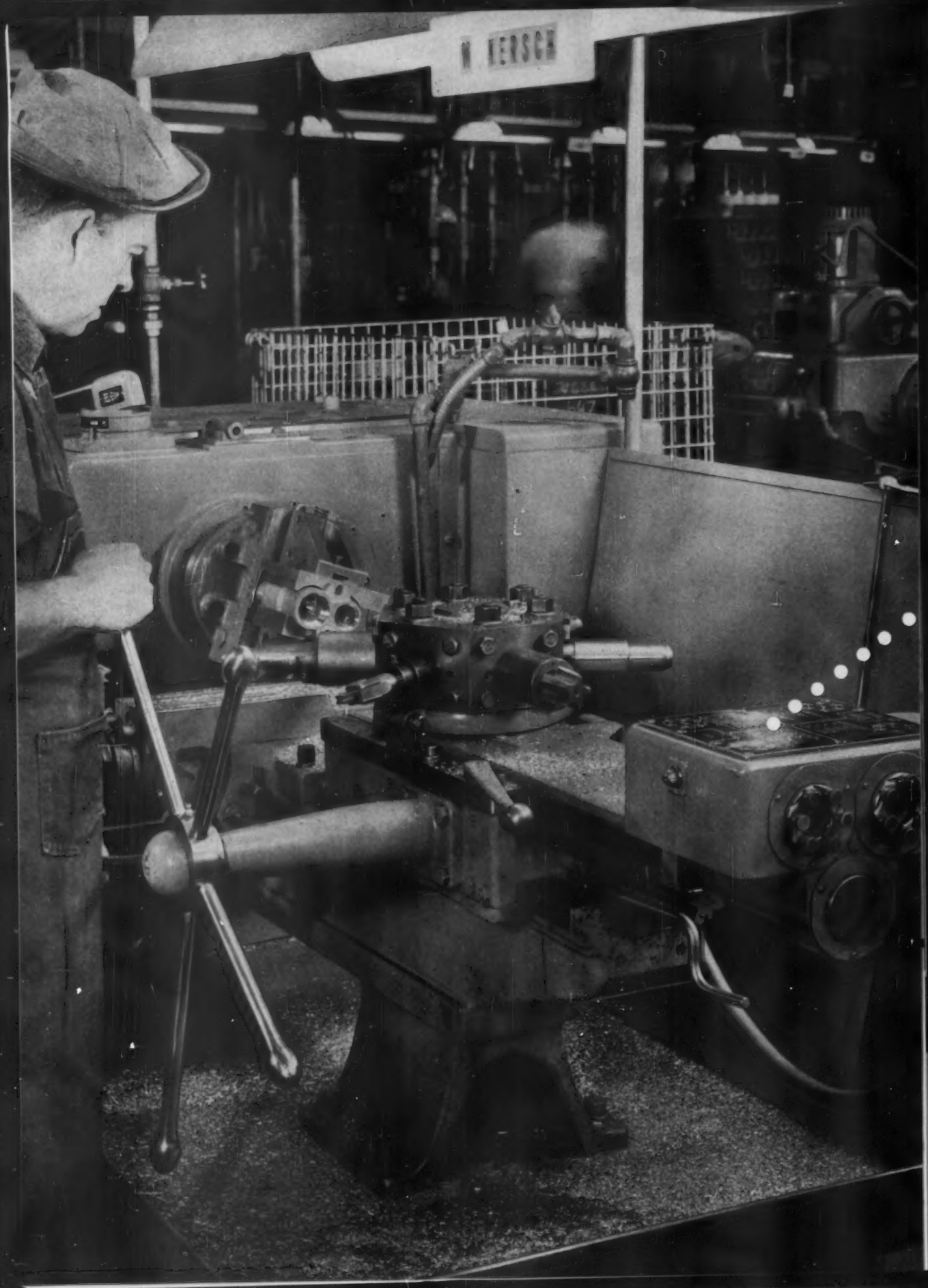
Grinding jobs which can be done on this machine

traverse and infeed

taper


face and angle


internal—straight and angle


W KERSCH

By simply presetting this Electro-Cycle Drum Control, spindle speed, starts and stops, spindle direction and reverses for each turret face are automatically controlled. Your operator can quickly handle large volumes of precision work, without tiring himself on time-consuming manual operations.

Warner & Swasey Electro-Cycle® Turret Lathe boosts production 30% at Decatur Pump Co.

Automatic lathe operation, provided by the Electro-Cycle principle, substantially reduced both handling time and operator fatigue. Immediately, production increased and profits improved.

This nationally-known producer of "Burks" Super Turbine and Centrifugal pumps, located in Decatur, Illinois, recently replaced a conventional geared head turret lathe with a new Warner & Swasey No. 3 Electro-Cycle. Immediately, their production of pump jet bodies—machined from bronze castings—increased 30%.

Using his new Electro-Cycle, the operator easily produced more finished parts per shift because:

- **Workpiece handling was cut to a minimum.**
- **Fatigue was substantially reduced.**
- **Automatic operation eliminated all time-consuming hand work.**

On both ferrous and non-ferrous materials, Electro-Cycles are daily turning in equally impressive records in machine shops all over the nation. Why not ask our Field Representative to show how they can help increase your production—and profits, too.

® Reg. U. S. Pat. Off.

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS . . . WITH A WARNER & SWASEY

ACCO Registered* Wire Rope Slings

Here's Why:

• Because these ACCO *Registered** CABLE-LAID slings combine the flexibility of manila rope with the strength of steel.

The secret of CABLE-LAID lies in the combination of a special wire-rope construction with ACCO's patented DUALOC ending. This combination gives

- **Freedom from Crankiness**
- **Extreme Flexibility**
- **Resistance to Kinking**

These qualities make CABLE-LAID slings tops in ease of handling...help them resist abuse ...give you longer sling life which reduces lifting costs.

And these slings are ACCO *Registered*—each part has been individually tested and the completed sling proof-tested at twice the load-carrying capacity for which it is rated.

See your ACCO *Registered* distributor, or write our Wilkes-Barre, Pennsylvania, office today.

FREE FOLDER

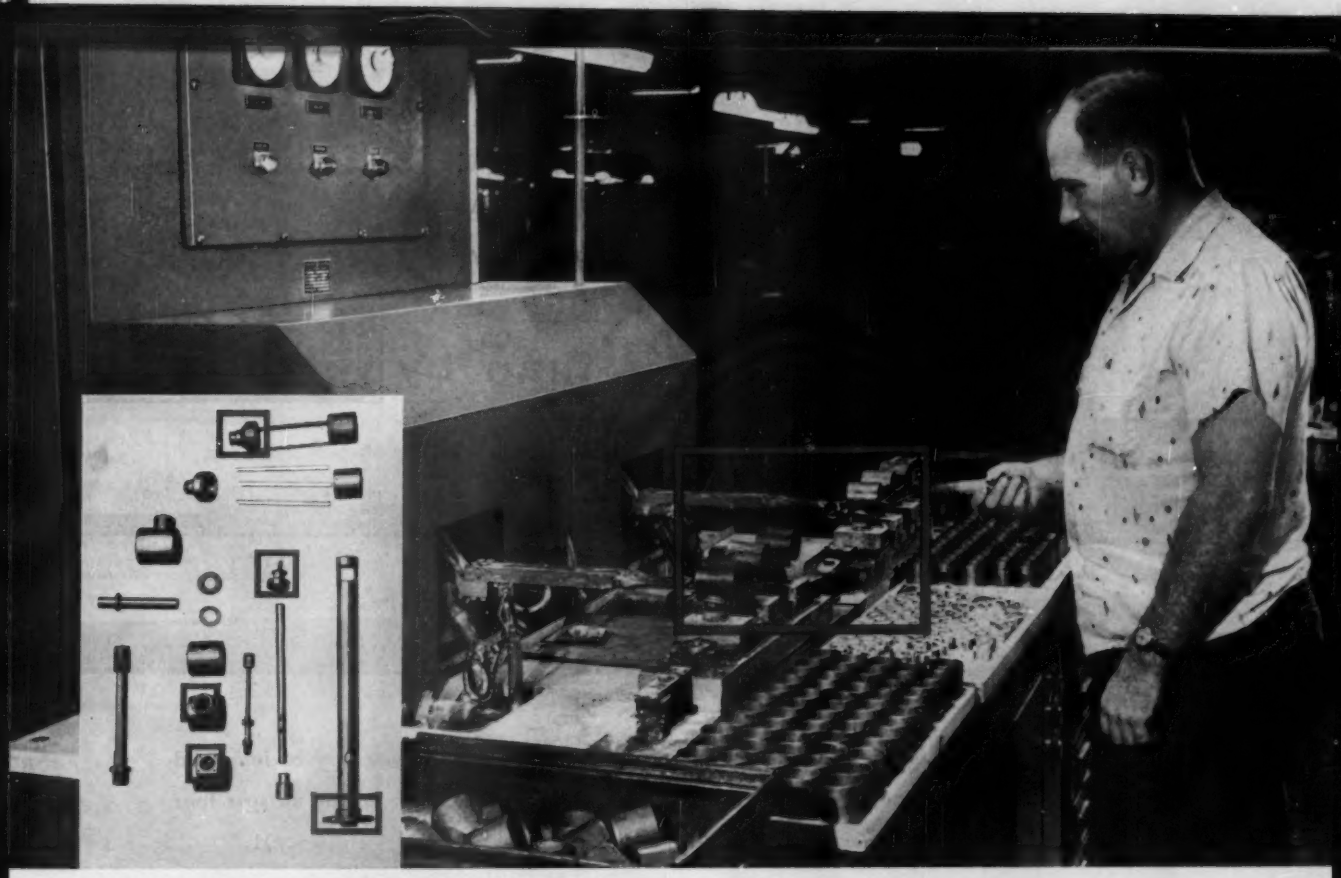
• *Write Wilkes-Barre office for your copy of new Folder* **DH-532**, *which gives strengths and weights (for six different lifts) on a full size range of ACCO Registered CABLE-LAID slings.*

*Trade Mark Registered

ACCO

American Chain & Cable Company, Inc., Wire Rope Sling Department

Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Bridgeport, Conn. In Canada: Dominion Chain Co., Ltd., Niagara Falls, Ont.



AT HARTFORD MACHINE SCREW CO.—

General Electric induction heaters braze 20 different parts, help cut rejects 91%

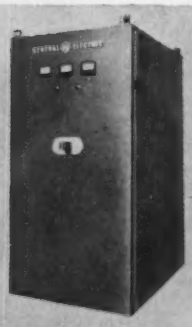
At Hartford Machine Screw Co., a General Electric electronic induction heater is used for brazing a wide variety of parts for electric-switch housings and jet engines.

The General Electric unit takes on jobs ranging from ¼-inch to 1½-inch tubing. After brazing, each part undergoes a regular 500-pound pressure test, and the aircraft work must pass radiographic inspection. With the General Electric induction heater, rejects have been reduced 91 per cent, from 30-35 per cent to a maximum of two per cent.

"If we need another induction heater, it definitely will be a General Electric," says A. O. Haversat, plant engineer. "The output control alone makes it virtually a MUST. This feature is just what we need for our kind of production. It eliminates guesswork and costly human errors. And it cuts out excess tooling, while still assuring uniform brazing."

General Electric electronic induction heaters are available in four ratings—7½-15-, 25-, and 40-kw, with a choice of four different models in each rating. The four models provide various control combinations, so you can buy the one induction heater which best matches your production pattern from the standpoint of both rating and control.

For more information, send in the coupon below or contact your nearby General Electric Apparatus Sales Office.



Four models in each of four ratings; 7½ Kw, 15 Kw, 25 Kw, and 40 Kw.

General Electric Co.
Section 722-6
Schenectady, N. Y.

PLEASE SEND ME A COPY OF BULLETIN GEA-6388

NAME_____

COMPANY_____

STREET_____

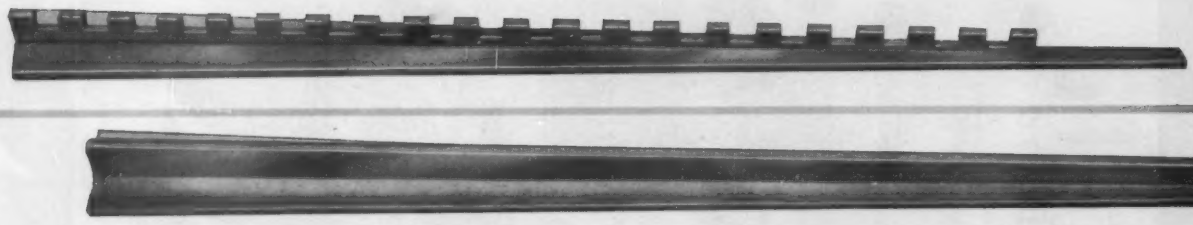
CITY_____ STATE_____

GENERAL ELECTRIC

LOOKING FOR FAST PRODUCTION?

there's no faster way to machine

than by LAPOINTE



With increasing emphasis being placed on higher net production, you may be interested to realize that you can broach 20 slots (⅝" x ⅜") in an aluminum missile fin spar four feet long, and produce 64 *completely broached parts per hour* (at 80% efficiency)!

The secret's in "gang-broaching", with eight broaches mounted on an 18-inch wide slide, and using a lateral type indexing table with all sequences fully automatic throughout. Lapointe-built fixtures are hydraulically operated, mounted on an In-and-Out table.

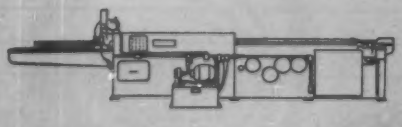
Some of the metal-removing operations in your shop probably can be performed faster and better by Lapointe-Broaching. It certainly would be to your advantage to find out . . . and an experienced Lapointe Field Engineer will gladly discuss the matter with you on request. How about writing us, today?

THE LAPOINTE MACHINE TOOL COMPANY

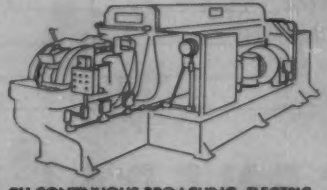
HUDSON, MASSACHUSETTS • U.S.A. *In England: Watford, Hertfordshire*

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

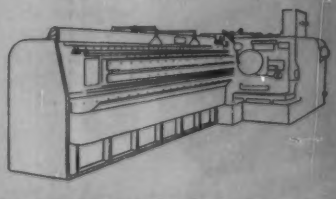
Here's a line of ELECTRO-MOTIVE DRIVE BROACHING MACHINES . . . . . available only at LAPOINTE



60" STROKE HORIZONTAL, ELECTRIC



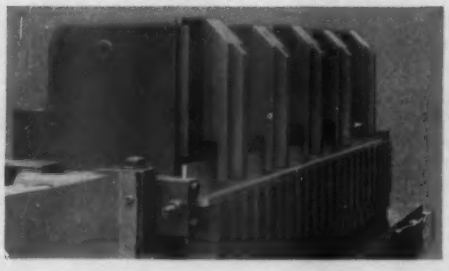
CH CONTINUOUS BROACHING, ELECTRIC



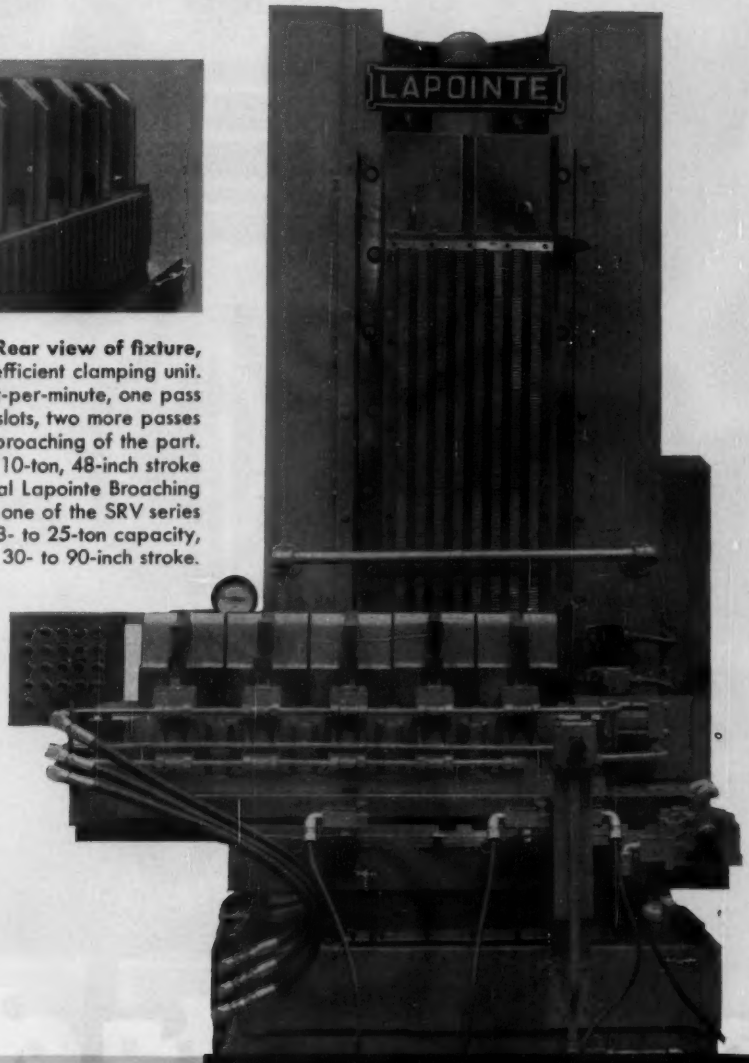
SRHE SINGLE RAM HORIZONTAL, ELECTRIC

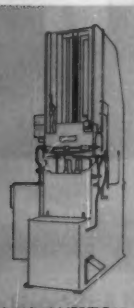
1280 slots per hour

-BROACHING!

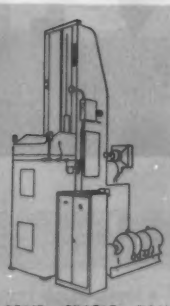


Rear view of fixture, showing the efficient clamping unit. Broaching at 60 feet-per-minute, one pass of ram broaches 8 slots, two more passes completing the broaching of the part. The machine is the 10-ton, 48-inch stroke Single Ram Vertical Lapointe Broaching Machine which is one of the SRV series ranging from 3- to 25-ton capacity, 30- to 90-inch stroke.





VUE-7 VERTICAL PULL-UP ELECTRIC



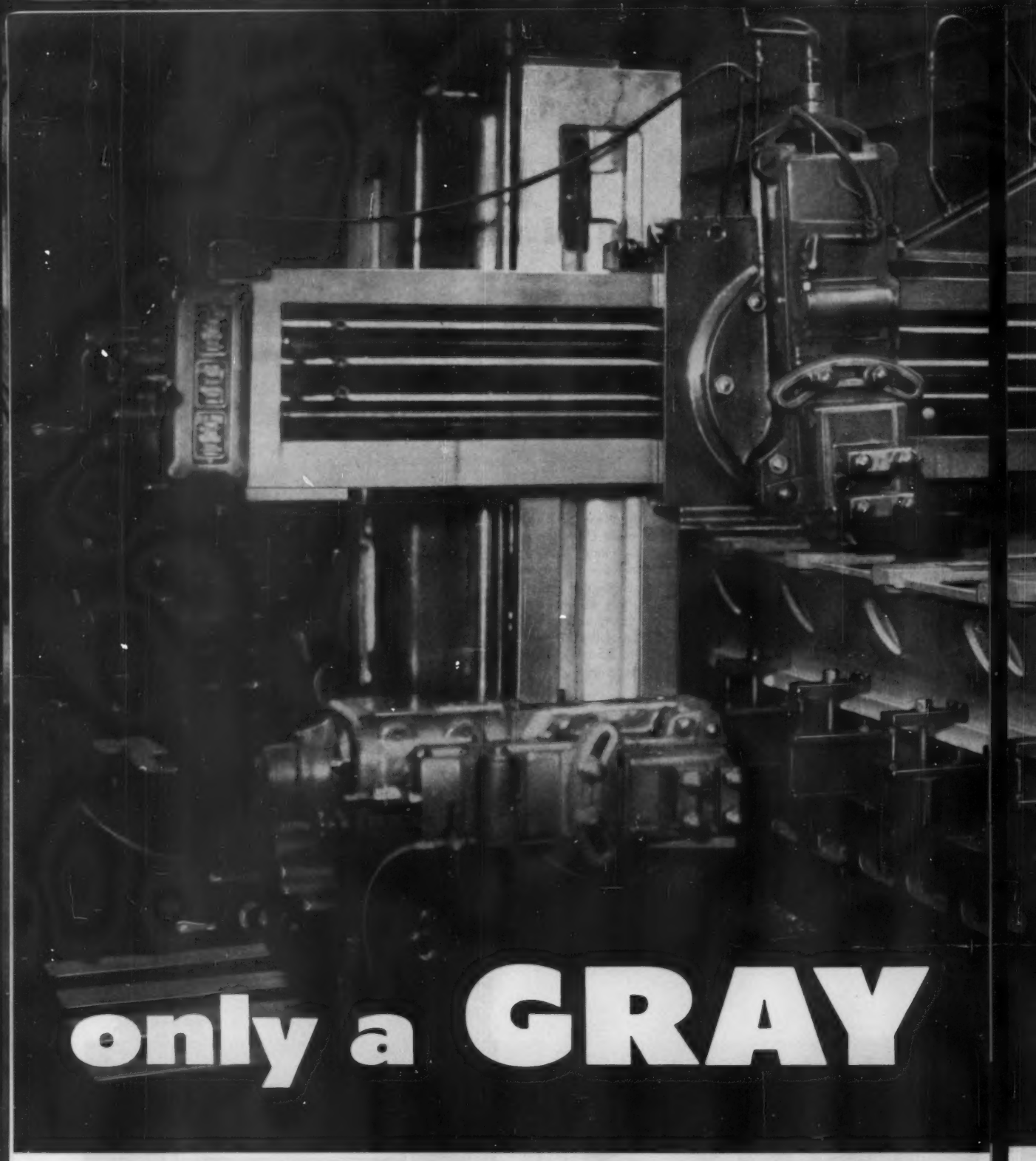
SRVE SINGLE RAM VERTICAL, ELECTRIC

DRVE DOUBLE RAM VERTICAL, ELECTRIC

LAPOINTE

known to be the best in

BROACHING



only a GRAY

Cuts going—cuts coming . . . that's "double-cutting" with the GRAY Universal Planer. At Textile Machine Works, Reading, Pennsylvania, this new GRAY is pictured double-cut carbide planing a Tricot Machine Base. Former floor to floor time of 62 hours has been slashed to 12 hours by the enormous productive potential of the new GRAY that cuts both ways.

The G. A. GRAY Co., Cincinnati, Ohio.

heavy-duty planing

The Gray Universal is the world's most powerful planer available for conventional planing. Its rigidity and speed are ideally suited for modern carbide cutting.

cuts both ways

double-cutting

The flick of a lever, the touch of a button permits double-cutting. Elimination of the idle stroke insures the world's most efficient flat surface machining. Only simple carbide tools are required.

triple-cutting

Rough and rough-finish plane at the same time. Rough by double-cut planing and simultaneously rough-finish with a single point tool. Then finish plane without a tool change.

cross planing

Eliminates extra settings by cross planing the occasional keyways, chamfered corners, and other troublesome small cross surfaces that formerly added hours to your set-up time.

The G. A. GRAY Co., Cincinnati, Ohio.

New Snyder Special Transfer Replaces Automation in Processing Forged Steel

Special Features of Snyder Machine No. 55-44

1. Production: 146 pieces per hour.
2. 26 Stations: 28 Operations per piece: 2 milling, 1 sawing, 4 hollow milling, 3 reaming, 1 countersinking, 10 drilling, 5 spotfacing, 1 threading and 1 tapping.
3. Palletized fixtures each carrying two parts.
4. Parts quickly and accurately clamped and located and unclamped by combination torque wrenches and hydraulically operated mechanisms at Stations 1 and 26.
5. Ten individual base segments provide maximum flexibility for future part design changes.
6. Ample room between segments for tool changes and maintenance.
7. Motorized fixture return conveyor with fixture washing unit.
8. Ample chip and coolant facilities.

Standard Features of Snyder Machines

1. SNYDER SELF-CONTAINED UNITS and other units equipped with hardened and ground ways.
2. Threading and tap heads equipped with individual leadscrew spindles.
3. Minimum downtime for tool changes because spindles are arranged for pre-set cutting tools.
4. Standard and special parts interchangeable for speed and economy in maintenance.
5. Motorized automatic lubrication system for all moving parts.
6. Construction to J.I.C. Standards throughout.
7. Master Push Button Panel and Light Console at Station 1.
8. Each unit equipped with its own push button control station for ease of tool setup and manual operation of unit.
9. Electrical interlocks and full depth circuit throughout.
10. Panels equipped with SNYDER CIRCUIT SLEUTH.

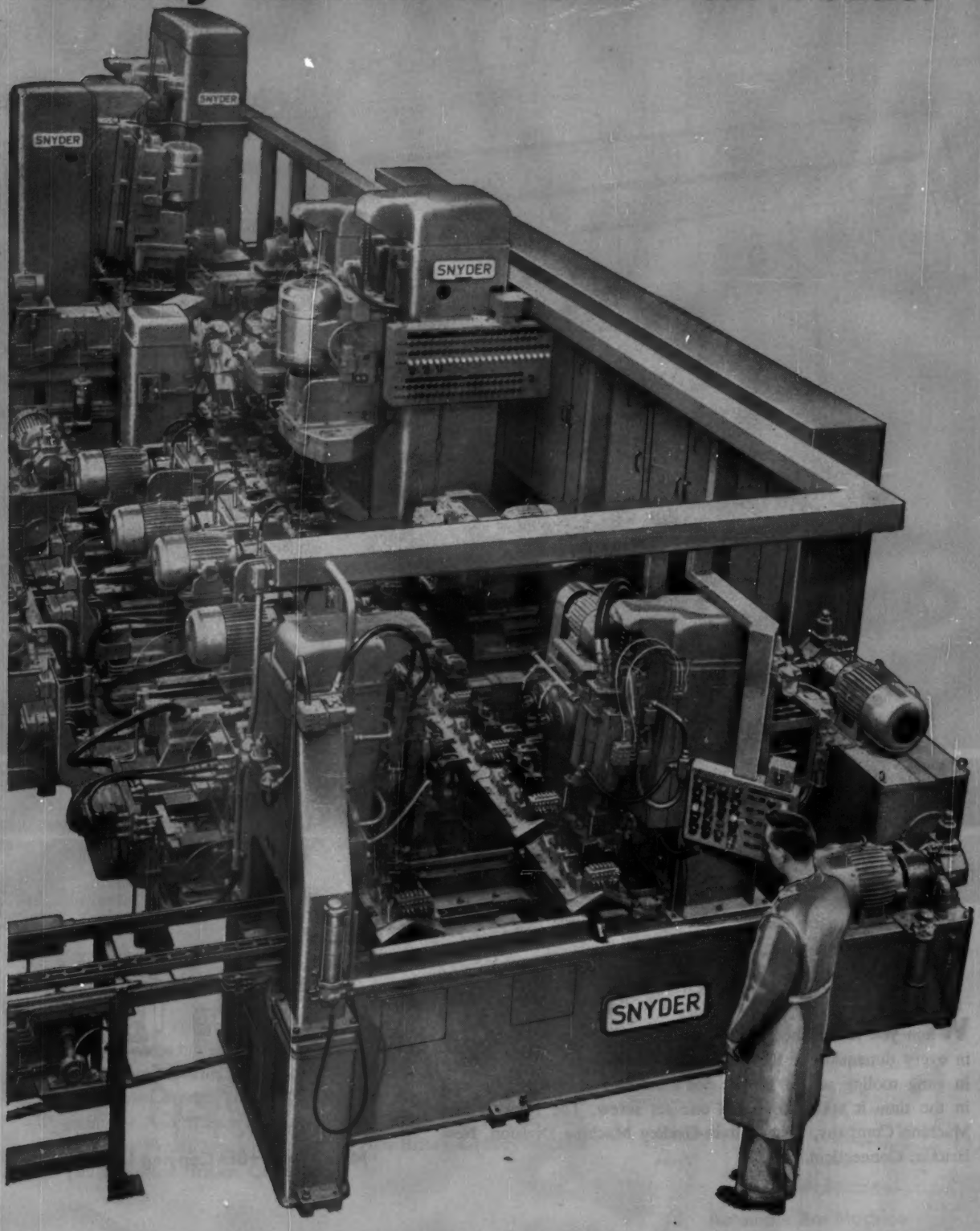
SNYDER

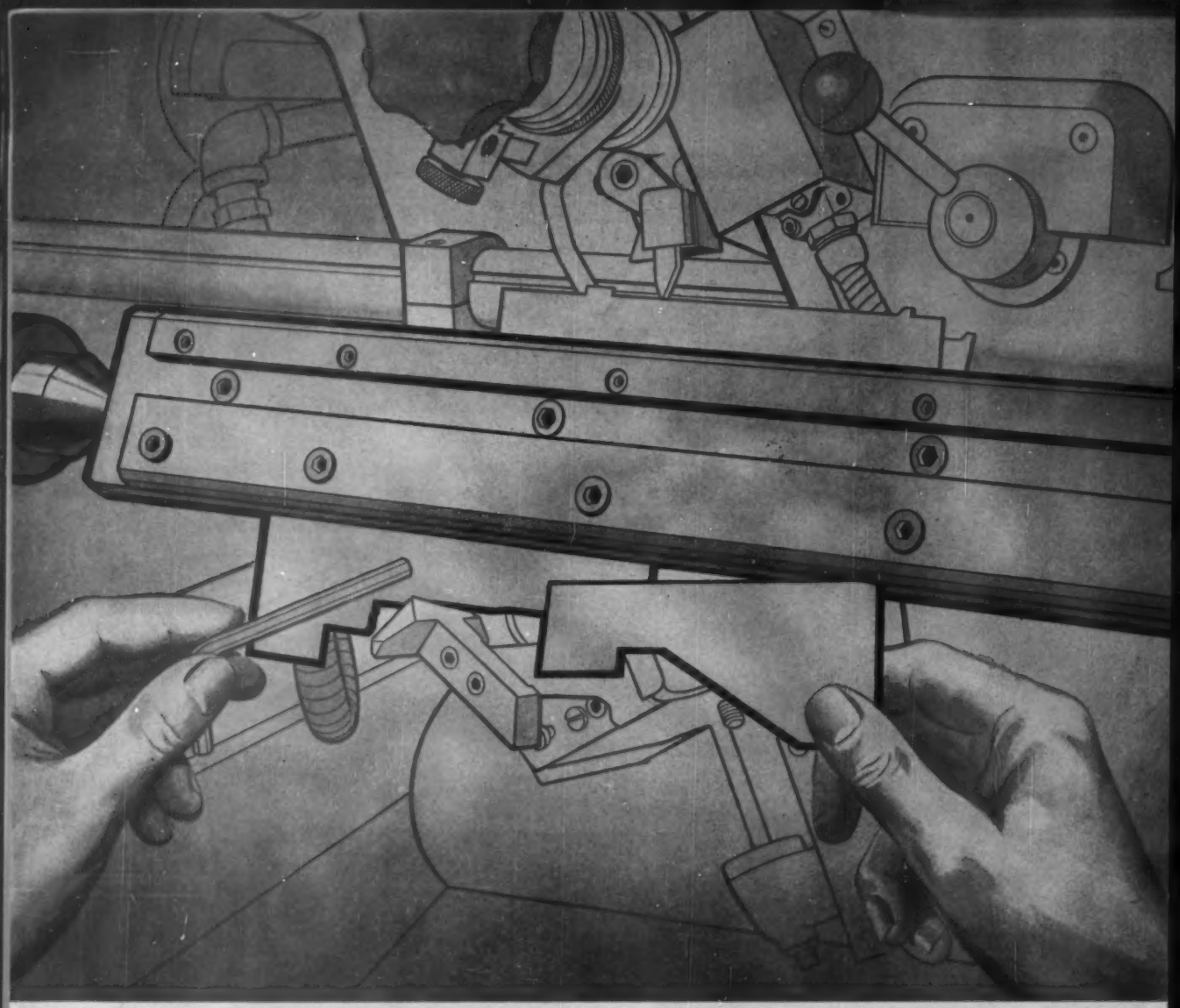
TOOL & ENGINEERING COMPANY

3400 E. LAFAYETTE • DETROIT 7, MICHIGAN

32 Years of Special Machine Tools with Automation

Several Semi-Standard Machines with Steering Knuckles for British Car Builder

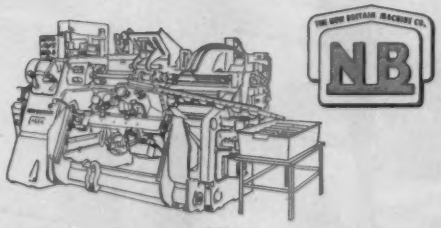




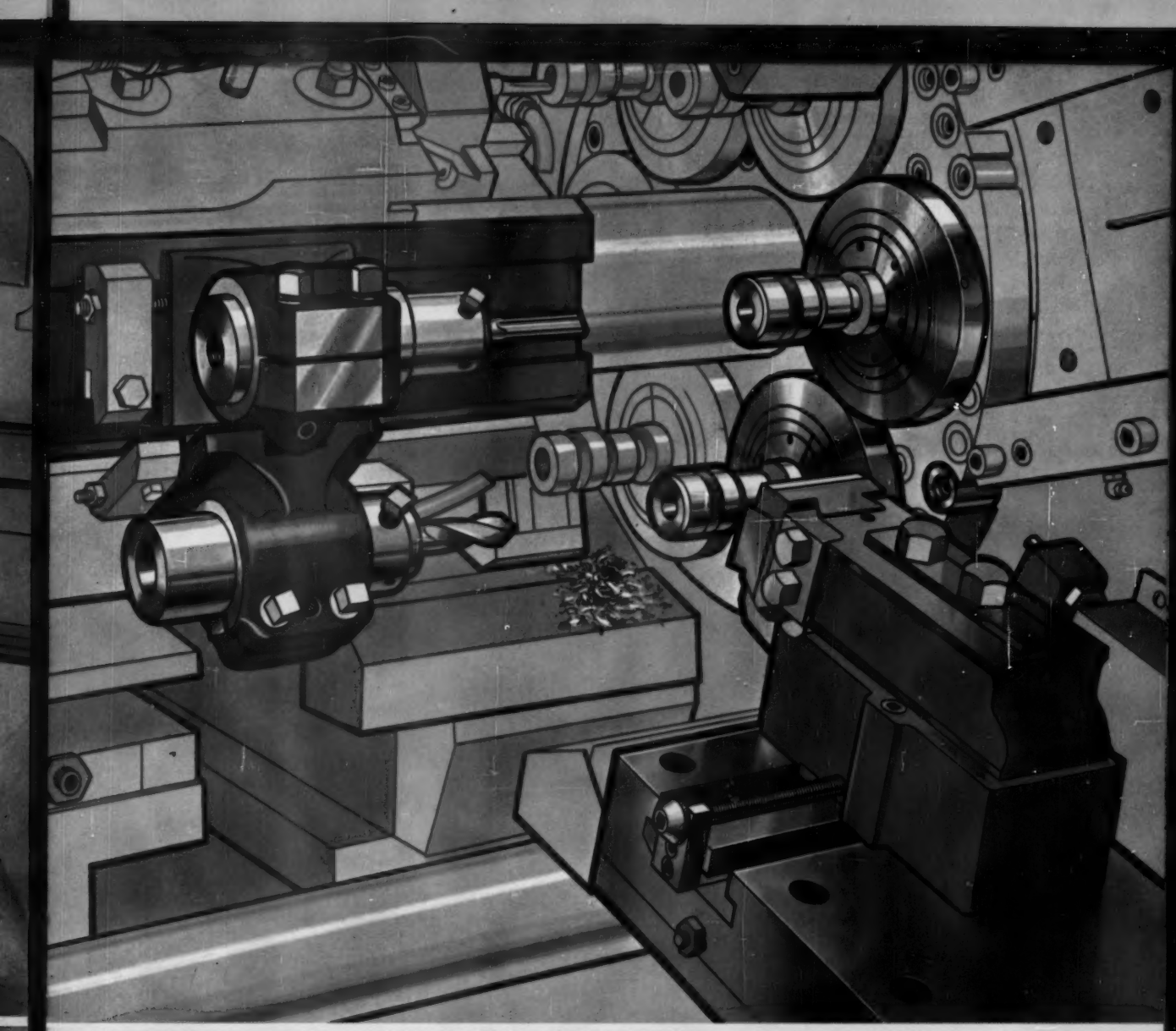
template control "locks in your dimensions"

on New Britain +GF+ copying lathes

When you fasten the template on a New Britain +GF+ you lock in every dimension of the piece. The complex settings necessary in gang tooling setups simply don't exist. You change the tool in the time it takes to loosen one set screw. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.

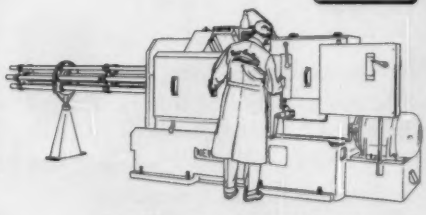


New Britain +GF+ Copying Lathe

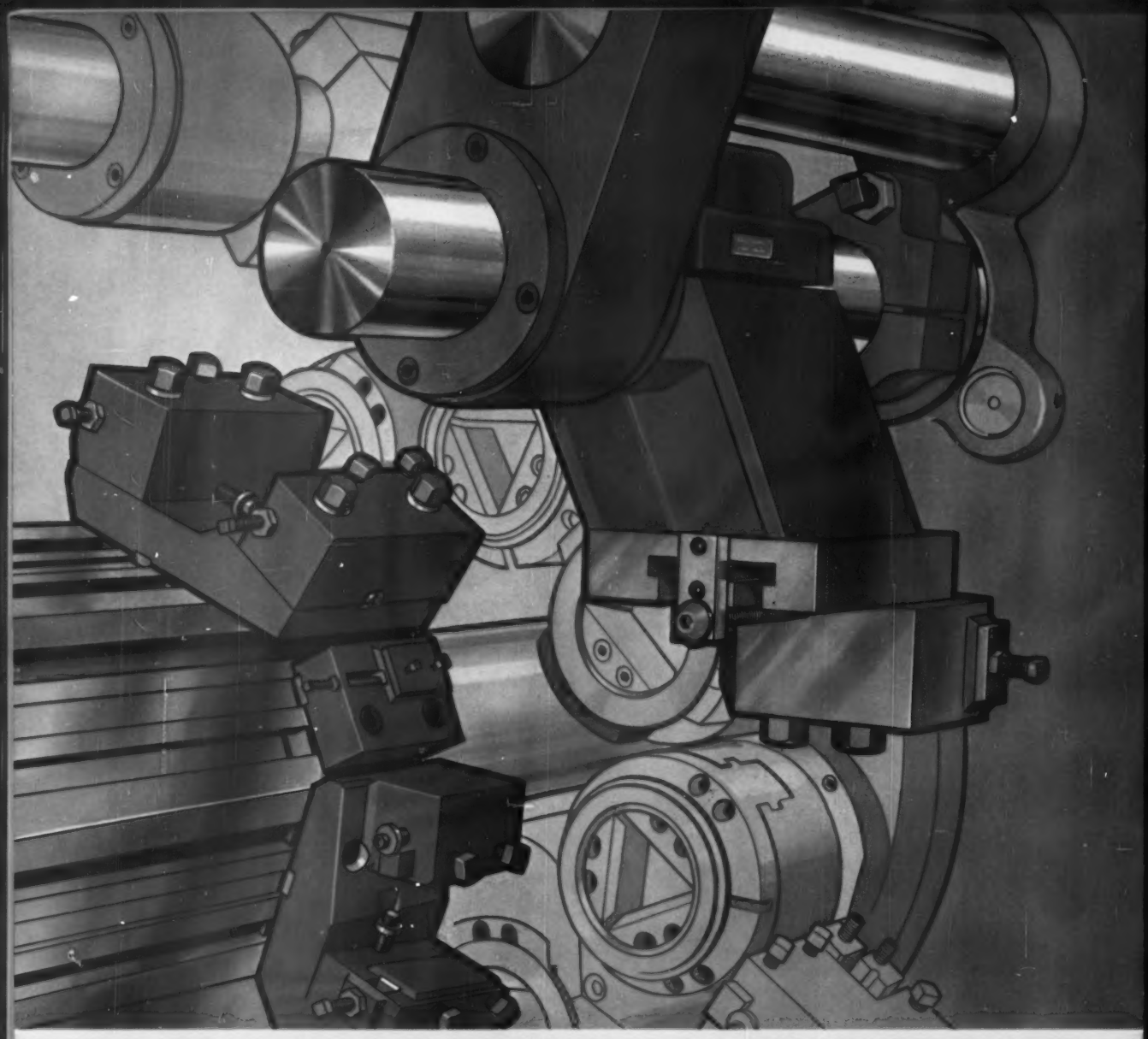


less wear means more profit

New Britain bar machines are "built to stay accurate." Hardened spindle nose cross slides, eccentric cross slide stop buttons and tool slides, plus carrier lifting during index, are only a few of many *exclusive* New Britain features for preserving long-run accuracy. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.



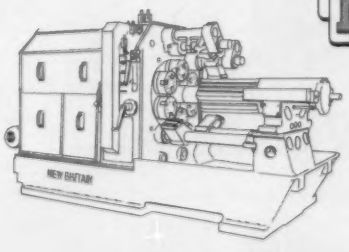
Automatic Bar Machine



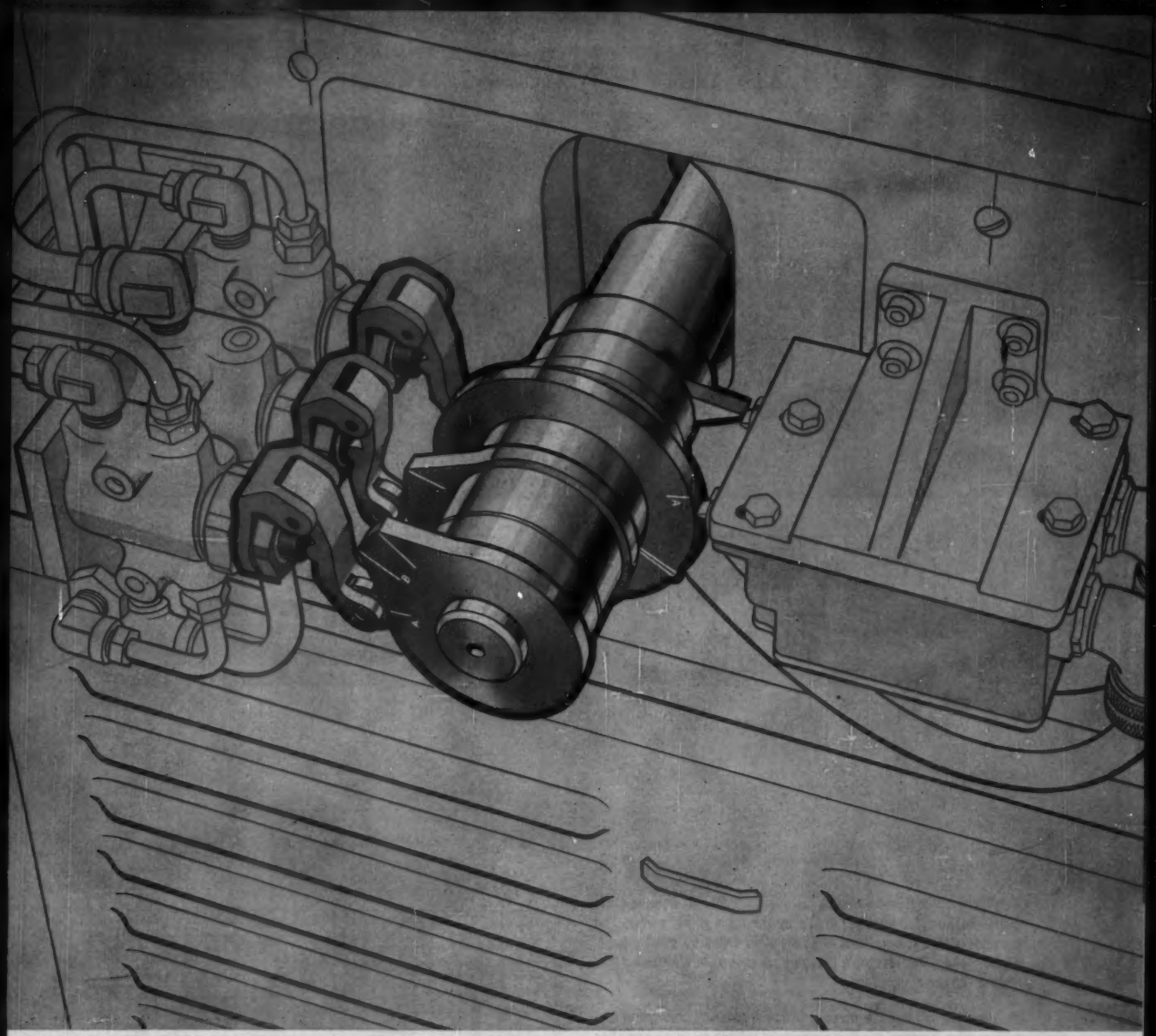
when the job calls for a big, husky chucker

pick a New Britain

New Britains are massive, not only in over-all size and weight, but in every individual feature. Rugged forming arms and tool slides transmit smooth power to the cutting edge in every position. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.



Automatic Chucking Machine



New Britain boring machines feature

exclusive mechanical program control

This New Britain feature means *positive control* which, in turn, means fewer mistakes, fewer rejects, and fully automatic operation, if desirable. Geared to the main cam shaft, it operates the sequence of operations, both electrical and pneumatic.

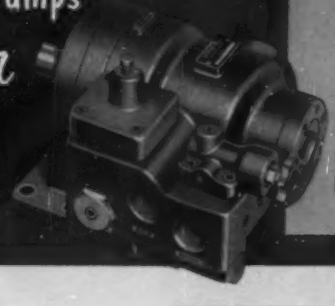
Combined with positive, accurate cam control of the tool slides, mechanical program control makes a New Britain boring machine your most dependable, accurate, and profitable investment for straight or contour boring and turning. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.

Precision Boring Machine

Do You Want To Save Horsepower and Heat?

VICKERS®

Two-Pressure Oil Hydraulic Pumps Require Less Power for Two-Pressure Circuits



Automatically Provide

High Volume @ Low Pressure for fast closing, rapid advance, and rapid return.

•

Low Volume @ High Pressure for feeding, compressing, clamping, and holding.

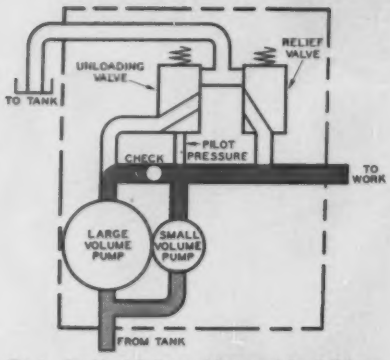


Fig. 1 Combined Delivery of Large and Small Volume Cartridges at Low Pressure

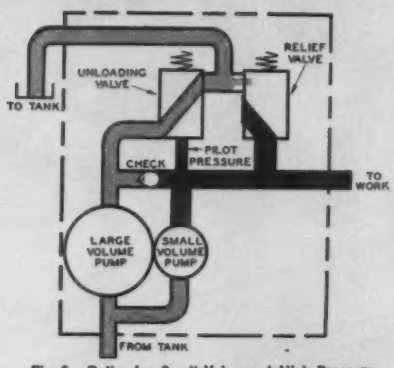


Fig. 2 Delivering Small Volume at High Pressure

Two Vickers Vane Type pumping cartridges are mounted on the same shaft—in the same housing, driven by the same prime mover. One provides a large volume of oil while the other delivers a small volume. These Vickers Two-Pressure Pumps have proved advantageous in a wide variety of applications.

For example, in closing a press or in rapid advance, both pump cartridges work together, supplying maximum volume for quick operation (see Fig. 1). When the press is closed and compression begins, or when the tool goes into feed immediately prior to beginning the cut, the large volume cartridge is automatically unloaded to the reservoir at zero pressure (see Fig. 2). The small volume cartridge alone then provides the lower volume required at high pressure.

These Vickers Two-Pressure Pumps are most economical in power consumption for such two-pressure operation. The reason for this is that a small-volume pump working at full capacity is MORE EFFICIENT than a large-volume pump working at partial capacity. Regardless of momentary delivery, the internal leakage of any pump is proportional to its size and operating pressure. The chart (Fig. 3) shows an interesting comparison between a Vickers Two-Pressure (Two-Volume) Pump and a variable volume vane type pump on a press circuit.

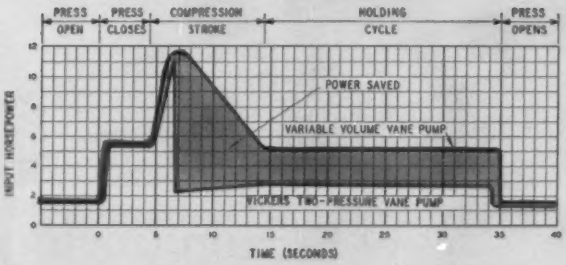


Fig. 3. On this typical press application the saving in power is approximately 50% with a resultant saving in heat in the system.

Like all Vickers Vane Pumps, these two-pressure pumps have the hydraulic balance feature that relieves bearings of all pressure loads (one of the major causes of wear). Cartridge construction enables customer to service in his own plant instead of returning to factory should repairs be necessary. Relief and unloading valves are integral . . . minimizing piping and connections. Complete range of sizes up to 48 gpm. For additional information, ask for Bulletin 54-70a.

6893

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Machinery Hydraulics Division
ADMINISTRATIVE and ENGINEERING CENTER
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ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

EX-CELL-O BUSHINGS LAST TWICE AS LONG

Customer's test proves there IS a difference in bushings

Recently one of the world's largest manufacturers of heavy equipment proved beyond doubt Ex-Cell-O Bushings last twice as long as the other bushings tested. That's good news for all users of bushings! After drilling 16,300 holes, leading bushing brands were measured. Wear on other makes of bushings averaged .0039"—ready for scrap—but wear in Ex-Cell-O Bushings averaged only .0017".

The reasons for this outstanding showing: (1) Ex-Cell-O Bushings are made of high chrome, high carbon oil-hardening bearing steel, (2) automatic atmosphere-controlled heat treating for uniform hardness, (3) precision grinding inside and out, (4) head type bushings and liners are ground under the head for perfect seating.

These bushings take the toughest production runs in stride. Make your own test—see and compare Ex-Cell-O.

Call your Ex-Cell-O Representative or write Ex-Cell-O, Detroit, for the high quality bushings used by major companies all over the world. You'll get "same day" shipment.

EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

EX-CELL-O FOR PRECISION

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56-53

BALANCED ACTION TOOLS BY WINTER

Winter tools are available from your distributor and from complete stocks at branch warehouses in New York • Chicago • Dallas • San Francisco • Los Angeles and at the Winter factory in Rochester, Michigan.

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A complete line of Plug and Ring Gages, Thread and Plain

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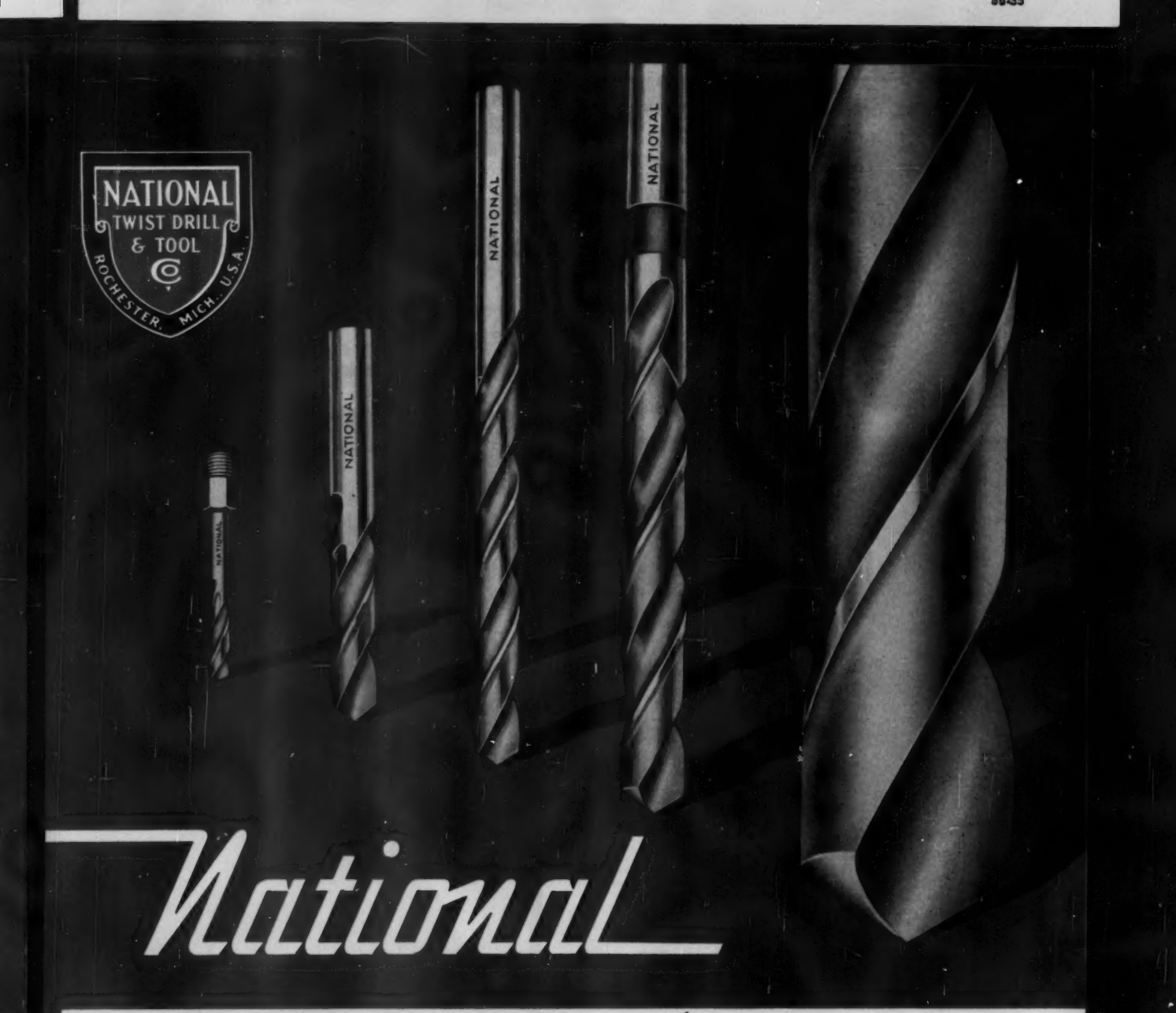

They Meet the Challenge of Today's Harder-to-Machine Metals

Not long ago it was said of some titanium and stainless steel alloys and of several high-tensile-strength steels: "They must be ground." But after concentrated laboratory research, National has improved its standard tools so that they now cut many of these harder metals.

NATIONAL TWIST DRILL AND TOOL COMPANY
Rochester, Michigan, U.S.A.

Distributors in principal cities. Branches in New York • Detroit • Cleveland • Chicago • Dallas • San Francisco • Los Angeles

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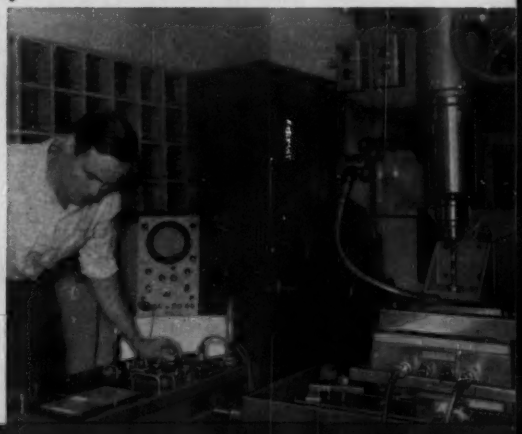
The search that never ends

Experimental drilling of one of the hard-to-cut materials



Giant Japanese built of formable,

1 **ONE-INCH PLATES OF USS "T-1" STEEL** ready for shipment to Tokyo from Chicago Bridge & Iron's Greenville, Pa. plant. This and other shop photos show the fabrication of plates for the third and fourth vessels, to be erected this year.

2 **COLD-FORMED** to spherical shape on this 300-ton C-frame press, USS "T-1" Steel is supplied rectangular, then torch-cut to size before forming.

3 **EDGES ARE BEVELED** for welding with a multiple acetylene torch. Finished plates are shipped, welded in the field. X-ray of all welds has shown that field welding was completely satisfactory. Joint efficiency is 90% of 36,000 psi, giving a maximum allowable working stress of 32,400 psi.

FACTS ABOUT VESSELS #1 & #2

Pressure	71.1 psi
Stress	36,000 x 90% = 32,400 psi*
Diameter	110.5 feet
Shell Thickness	0.73 inch
Geometric Volume	707,000 cu. ft.
Released Volume	3,420,000 cu. ft.
Weight of Both Vessels	1,250 tons
Weight Saved by Using USS "T-1" Steel	1,720 tons

*Non-Code

USS "T1" CONSTRUCTIONAL ALLOY STEEL

"USS" and "T-1" are registered trademarks.

USS

7-286

Pressure Vessels weldable USS "T-1" STEEL

It took the great yield strength (90,000 psi minimum) and the fabricability of USS "T-1" Steel to make these two giant pressure vessels feasible. They are now in service in Tokyo, Japan, and two additional vessels currently are being fabricated. All four vessels were designed, fabricated and will be erected by Chicago Bridge & Iron Company. The vessels will be used for the storage of natural gas by Tokyo Gas Works, Ltd.

All shell material of the two erected vessels, as well as top sections of the tubular supporting columns, is USS "T-1" Steel, Firebox Quality. All fittings, including nozzles and manways, are USS "T-1" Steel forgings. Shell plates are 0.73-inch thick, compared to mild steel plates 1.75 inches thick. *This represents a savings of 1,720 tons of steel.*

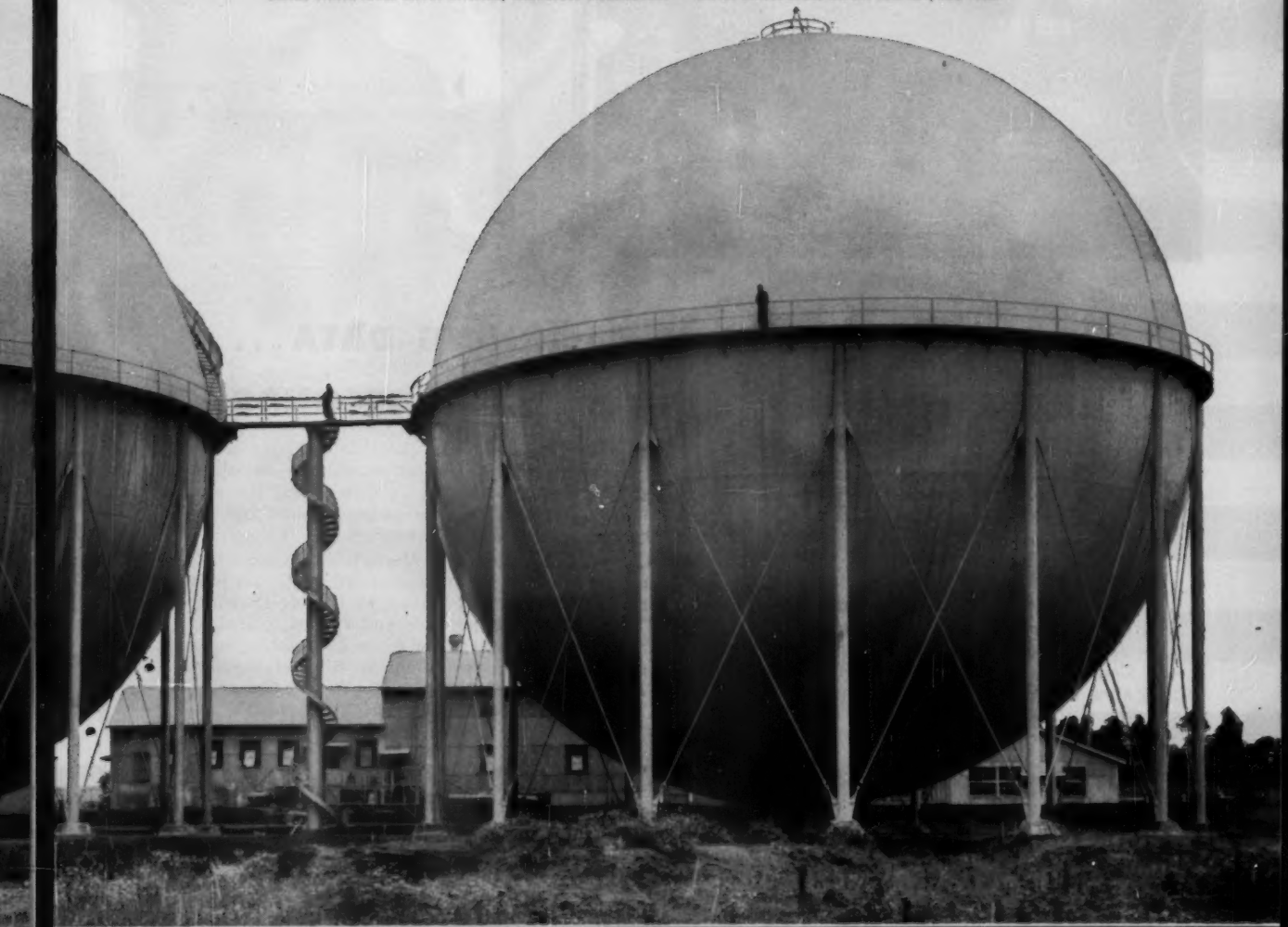
Fabrication sequence was as follows:

1. USS "T-1" Steel plates multiple acetylene torch-cut to size.
2. Sized plates *cold*-formed to spherical shape.
3. Edges torch-beveled for welding.
4. Fittings, where required, welded in and the assembly stress-relieved at 1150° F.
5. Fabricated plates then shipped for field erection. Field welding done with E 12016 electrodes. All welds were 100% X-rayed. Stress relief was not required.

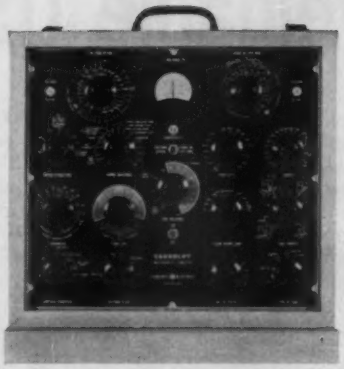
This honor roll, so to speak, of fabrication steps proves that USS "T-1" Steel is indeed a versatile steel. With the proper techniques and precautions, it responds as well to fabrication as does carbon steel.

And USS "T-1" Steel's *combination* of fabricability with high yield and ultimate strengths, extraordinary toughness at high and low temperatures, and impact-abrasion resistance make it unique as well as versatile. USS "T-1" Steel can very likely improve your product, cut your costs. For full information about its fabrication and application, write United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

UNITED STATES STEEL CORPORATION, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS • UNITED STATES STEEL EXPORT COMPANY, NEW YORK



UNITED STATES STEEL



CARBOLOY
MACHINABILITY COMPUTER

- Ends time-consuming tryout runs; saves valuable stock
- Shows you how to get maximum machine output at lowest cost

JUST DIAL IN KNOWN MACHINING DATA... SOLVE TOOL SETUP PROBLEMS IN SECONDS

The Carboloy Machinability Computer accurately predicts how your tools and machines will perform on any job. Faster than any other method of figuring job setups, it calculates the effect of 19 basic machining variables on machine performance, tool life, and output.

With this information, you can check the accuracy of existing setups, determine new machining standards, eliminate costly pilot runs. With the Computer, you can quickly see how to vary operating conditions to gain maximum efficiency from the cutting tool, the machine, and the operator. Simply set up the known machining variables on the Computer dials . . . then adjust the unknown variable until the Computer shows that the correct setting has been reached.

Hundreds of Carboloy Machinability Computers are now in use throughout industry . . . on jobs ranging from initial setups to trouble-shooting. The Computer is portable and rugged; priced at $495 (f.o.b. Detroit). For more information, or a demonstration in your plant, write: *Metallurgical Products Department of General Electric Company, 11149 E. 8 Mile Street, Detroit 32, Michigan.*

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GENERAL ELECTRIC

better performance... greater value... are built into

CINCINNATI
TRAY-TOP LATHES

World-famous "Cincinnati" design and engineering are fully reflected in the new Tray-Top Lathes. They incorporate precision workmanship and quality features usually associated with larger, more costly equipment.

The all-geared headstock of the Cincinnati Tray-Top provides optimum power transmission throughout all 12 spindle speeds. The speed range gives you the right combination of highs and lows to handle a wide variety of materials and diameters using all types of tools. All transmission gears and shafts are hardened for maximum service, and are mounted in anti-friction bearings.

Other advanced features of the economy-priced Tray-Top are listed below. For the complete Tray-Top feature story, see the CL &T dealer in your area. For catalog data, write Cincinnati Lathe & Tool Co 3207 Disney St., Cincinnati 9, Ohio.

Cincinnati 15" Tray-Top Lathe. Also available in 10", 12½", 18", 21½" and 26" sizes.

Rugged alloy steel spindle mounted in three precision anti-friction bearings.

Three-lever "color-match" direct reading speed change dial.

Totally enclosed quick change gear box, incorporating leadscrew reverse. 48 or 54 thread-feed changes.

"Hardclad" flame hardened and ground bed ways.

center on **cincinnati lathes and drills**

Builders of Engine, Toolroom, and Fixed Gap Bed Lathes and a Complete Line of Drilling Machines

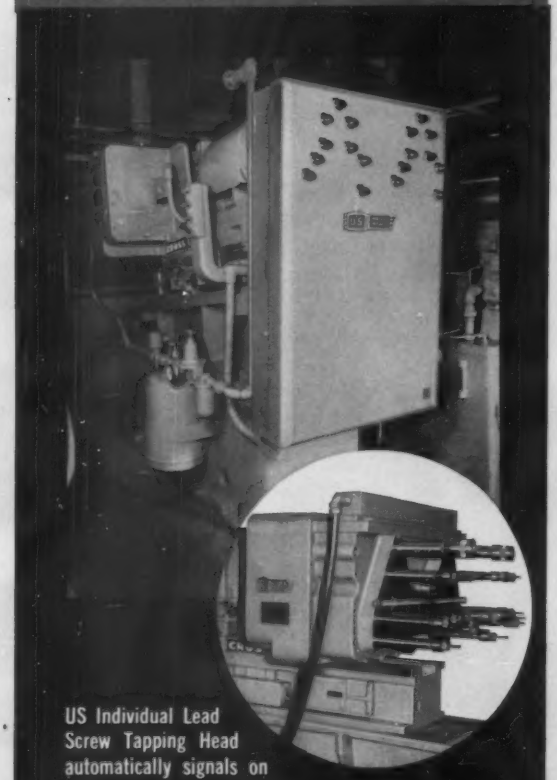
U. S. NAVY PHOTO

Trouble Spotter...

This majestic cruiser is a U. S. Navy airship. Its mission is locating trouble—*ahead of time*. How effective its deadly purpose in convoy is attested by the fact that "no vessel escorted by a blimp in World War II was sunk by an enemy submarine." Its invaluable contribution to our Aircraft Early Warning system is also firmly established. It is a Navy "tool" that virtually eliminates surprise.

The U. S. Drill Head Co.'s new electronic device seeks trouble too—in automated production lines. It locates faulty machining during a "transfer setup" and stops the machine *before* succeeding operations are begun. It minimizes the chance of costly smash-ups and resulting expensive down-time . . . reduces re-operating and scrap-loss costs.

This development is another precision cost-reducing "tool" from the largest exclusive drill head builder in the world.



US Individual Lead Screw Tapping Head automatically signals on a light panel exact location of any spindle not tapping to full depth, and stops the entire line. In addition, patented US Safety Tap Spindles prevent all tap breakage due to dull taps or improperly drilled holes. Installed on transfer machines, this exclusive US development provides dual automatic protection during tapping without need for an extra probing station.

We manufacture all types of adjustable, fixed center and individual lead screw tapping heads. Ask us to help solve your multiple drilling and tapping problems.

US DRILL HEAD

UNITED STATES DRILL HEAD CO.

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A NEW APPLICATION GUIDE

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This handy Guide is carefully planned to make it easy for you to select electric motors for all popular applications. Using the convenient tables inside, you simply start with the equipment or machinery you want to drive.

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1/20 to 400 HP

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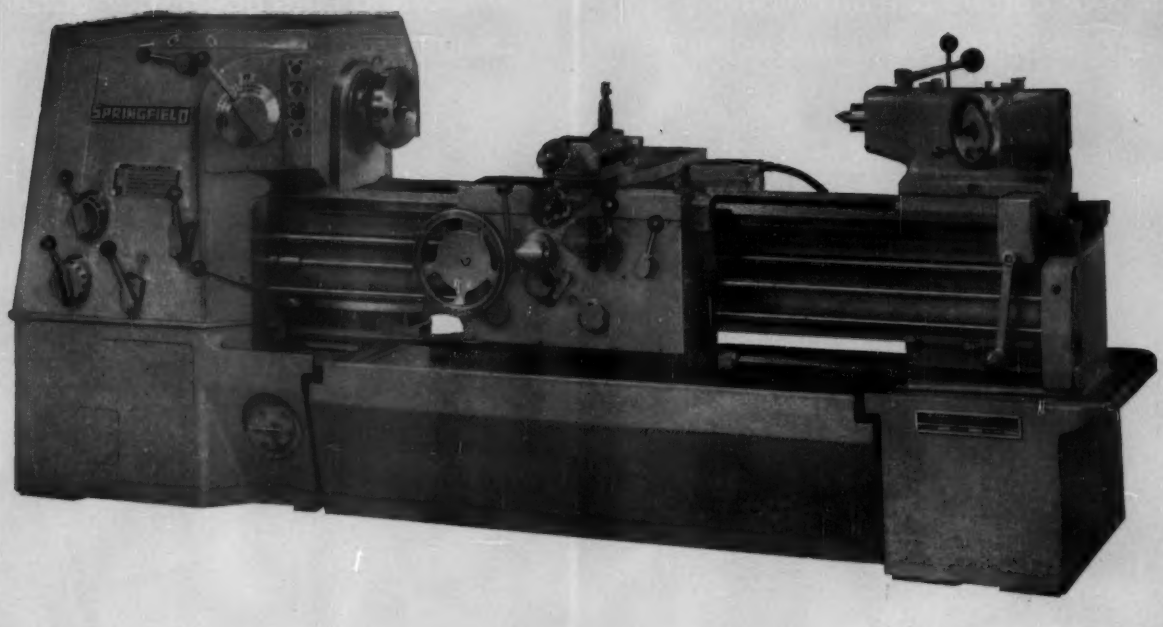
SPRINGFIELD



more useful horsepower

All the horsepower in a Springfield Model "S" Lathe is productive.
A simple, straight-forward gear train, plus double-action lubrication, plus tight dynamic balance tolerances (.0005" displacement) eliminate friction and vibration, the twin horsepower thieves.
In the headstock, only the gears necessary to a given speed are engaged. Other gears run free with a stabilizing flywheel action, no drag on power.
A high pressure filtered oil mist keeps all gears and bearings drenched, and a cascade of oil lubricates the feed box.

Lathes: Engine and tool room, contouring and reproducing—swings 14" to 32".
Vertical Universal Grinders: swings 18" to 42".

The Springfield Machine Tool Company
Springfield, Ohio

68TH YEAR OF BUILDING IDEAS INTO MACHINE TOOLS

SPRINGFIELD

If your cutters pile up chips as fast as bulldozers pile up earth...

This brand cuts down your cutter usage, production time and costs!

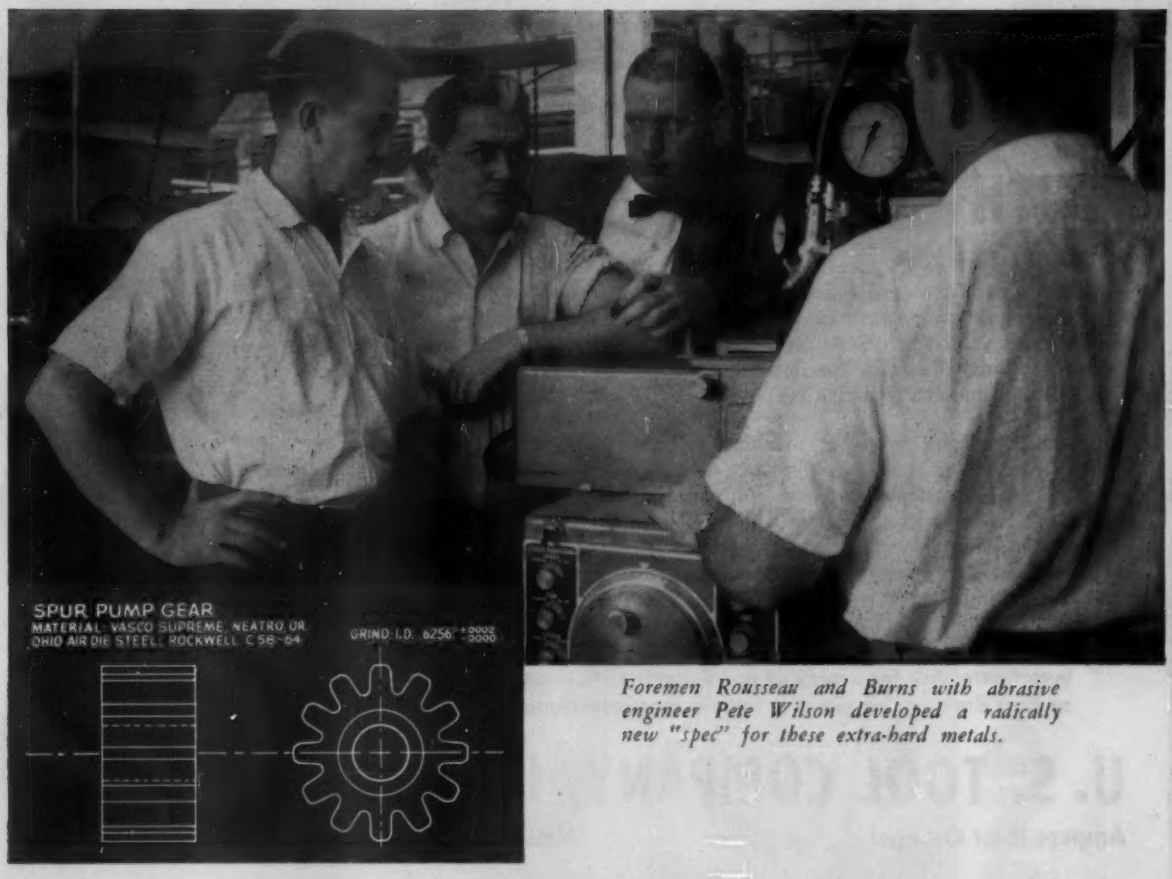
The more cutters you use, the more you need Union

Union manufactures milling cutters, gear cutters, drills, end mills, reamers, hobs and carbide tools. Available nationally through Union Distributors and stocked in Union warehouses in Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York City and San Francisco. S. W. CARD DIVISION, Mansfield, Mass.; BUTTERFIELD DIVISION, Derby Line, Vermont.

UNION

TWIST DRILL COMPANY, Athol, Massachusetts

See Your UNION DISTRIBUTOR for cutting tools that will save you time and money



Foremen Rousseau and Burns with abrasive engineer Pete Wilson developed a radically new "spec" for these extra-hard metals.

A GRINDING PROGRESS REPORT

Extra Fine Grit Silicon Carbide Succeeds In Tough Vasco Supreme I. D. Grinding Job.

Finer grits and "softer" wheels are the usual approach to grinding hard metals. This was not enough, however, on the hardened die steels required at the W. H. Nichols Co., Waltham, Mass. Wheels soft enough to cut, with the limited pressure of internal grinding, were too soft to hold shape.

Recommended: Silicon Carbide grain, for better penetration into these metals of high carbide content, and grits much finer than the normal 90, to take smaller chips but more of them.

Results: Using 240 grit on the Vasco Supreme, and 150 on the Neatro and Ohio Air Die steels brought about both the quality and quantity of production desired. With wheel dressing reduced to ⅛ the amount formerly required, 50 or more pieces are now completed per wheel.

These results are typical of Bay State. You can get them through your local distributor, any branch office, or the Bay State Abrasive Products Co., Westboro, Massachusetts.

Branch offices are located in Bristol, Conn., Chicago, Ill., Cleveland, Ohio, Detroit, Mich., Pittsburgh, Pa., with distributors in all principal cities.

Slender spindle and large contact area limit infeed pressure, making wheel selection critical on hard, abrasion resistant metals.

BAY STATE ®
WHEELS of PROGRESS

INCREASE PROFIT MARGIN ON FORMED STAMPINGS WITH U. S. MULTI-SLIDES®

Reduce your costs and increase your profit potential! Elimination of secondary operations and handlings results in reduced costs. It is therefore important to produce parts, wherever possible, complete in one machine. The U. S. Multi-Slide, through a combination of built-in motions, allows for the designing of tools to fabricate precision formed metal stampings without secondary handlings.

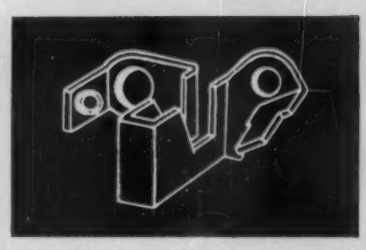
Standard equipment on the machine includes: ram action for cutting, piercing, trimming, embossing, etc.; a four-slide forming position, and a vertical movement for stripping and transferring. Since these movements are part of the machine equipment, it is not necessary to incorporate complicated movements into the dies themselves. The machines are built in four sizes, and on the three larger units it is possible to use two or more rams simultaneously, as illustrated in the sequence of operations drawing below.

Investigate. Ask for a copy of our Bulletin 15A, or send us part drawings or samples for our recommendations.

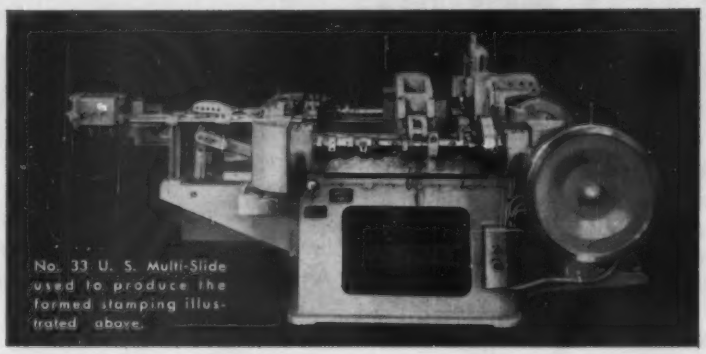
U. S. TOOL COMPANY, INC.

Ampere (East Orange) **New Jersey**

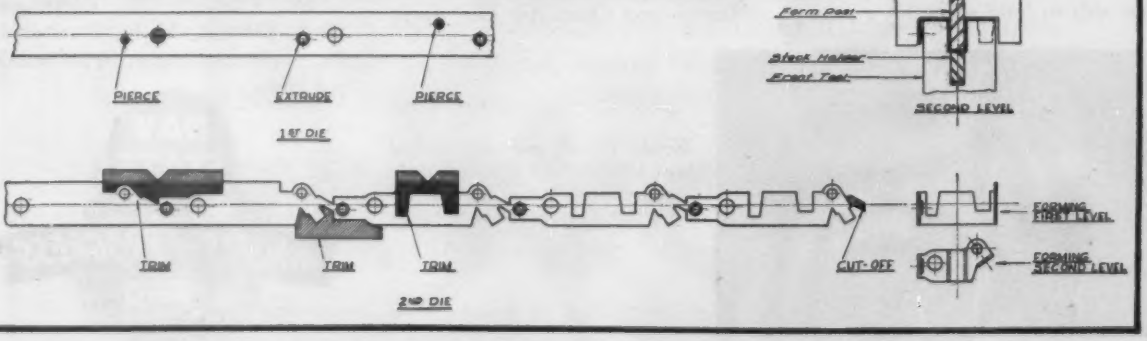
Builders of U. S. Multi-Slides — U. S. Multi-Millers — U. S. Automatic Press Room Equipment—U. S. Die Sets and Accessories

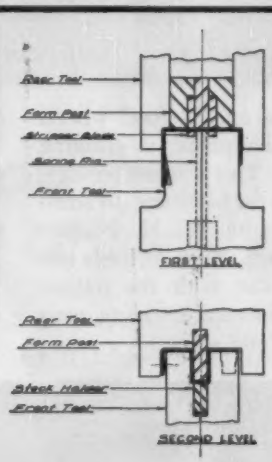


The automotive component shown above is produced complete, without secondary operations, in the No. 33 U. S. Multi-Slide Machine. Drawings below indicate the sequence of stages in the dies and forming positions. Observe the two-level forming position used to complete the piece after cutting off.



No. 33 U. S. Multi-Slide used to produce the formed stamping illustrated above.





IMPORTANT: For your convenience this sheet is perforated. Tear it out and "buck-slip" it to the proper man in your plant.

Read how Carborundum® B7 Cut-Off Wheels "met the test," on the back of this page.

Super-strength B7 Resinoid Bond Wheels are resistant to mechanical shock — faster, safer at higher speeds for cut-off operations.

Ask the man from **CARBORUNDUM** REGISTERED TRADE MARK **BONDED ABRASIVES DIVISION**

Also makers of a complete line of Coated Abrasives and Abrasive Grain

ATTENTION CUT-OFF FOREMAN: Turn the page and see the Product Performance Report written especially for you.

PRINTED IN U.S.A. 700

Product Performance Report

CHOPPER TYPE CUT-OFF MACHINE—DRY CUTTING

Operation

Cutting off 1¼" diameter cold rolled C1020 steel. Dry cutting.

Project

Obtain greatest number of cuts per wheel. Increase production with economy of abrasive cut-off. Minimum burn consistent with wheel life.

Test

Use Carborundum Company new B7 Bond Cut-Off Wheel 16 x ⅛ x1 in the following grades:

A30-R-B7
A30-T-B7
A30-V-B7

Method

Stop watch contact time. Use a fast and steady pressure —do not stall machine. Measure wheel diameter start and finish. Make 24 cuts per wheel.

Results

Wheel	Number of Cuts Per Square Inch of Abrasive	
A30-R-B7	1.40	No burn
A30-T-B7	1.83	Brown burn
A30-V-B7	2.89	Blue burn

Customer accepted brown burn and decided on the A30-T-B7 grading.

Note

Carborundum, leader in abrasive techniques, backs up its products with trained sales representatives, a staff of competent field engineers and an abrasive engineering laboratory ...all available to you to put more sense in your abrasive dollar.

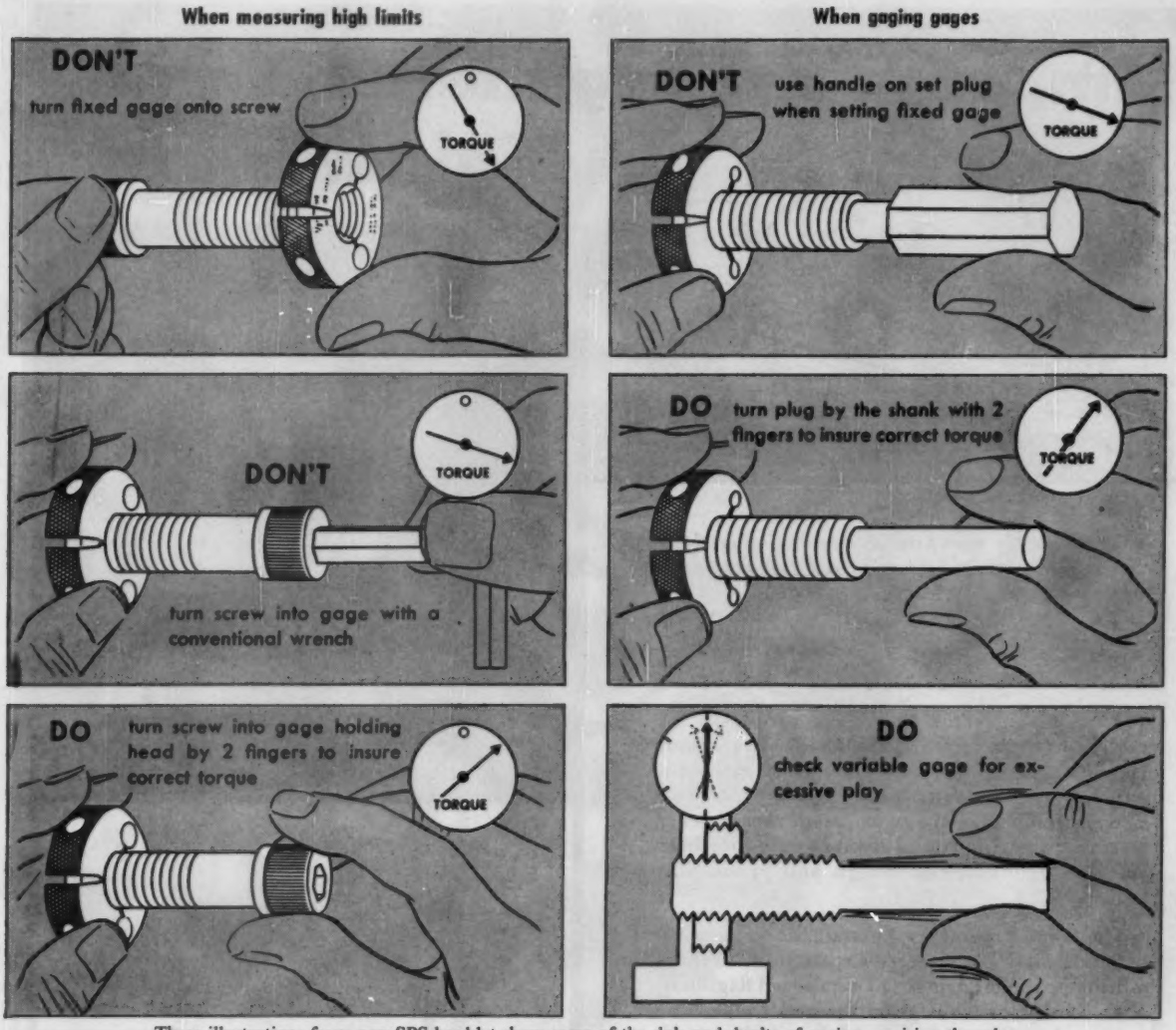
TRY ONE YOURSELF. A simple demonstration in your shop on any material you're cutting, will convince you that B7 Bond Resinoid Cut-Off Wheels will outperform any other wheels you can use.

Here is another in the series of Product Performance Reports being released by the Bonded Abrasives Division of The Carborundum Company. A color photograph of this actual operation is shown on the back of this page.

• *Ask your local distributor... or the man from*

CARBORUNDUM
REGISTERED TRADE MARK

783 PRINTED IN U.S.A.



These illustrations from new SPS booklet show some of the do's and don'ts of gaging precision threads.

3A threads: what they are; how to gage them — new SPS booklet tells all

Threads made to Class 3A fit are the most precise in general use in industry. But you do not always get the 3A precision you specify. Because of many different gaging techniques that yield varying results, screws with threads well outside the Class 3A tolerance limits often pass inspection.

SPS has prepared a new booklet on this subject. It explains clearly what Class 3A threads are and the pros and cons involved in the widely varying gaging techniques in use today. It reviews the gaging of high and low limits of 3A threads, sampling techniques, and even the methods of gaging gages.

All standard UNBRAKO socket screw products fall within specified tolerance limits *no matter what method is used to gage them.* Leading industrial distributors carry complete stocks. Unbrako Socket Screw Division, STANDARD PRESSED STEEL Co., Jenkintown 1, Pa.

Form 2239, "Class 3A Threads: what they are; how to gage them." 16 pages, with many illustrations. Write for free copy today.

STANDARD PRESSED STEEL CO.

UNBRAKO SOCKET SCREW DIVISION SPS

JENKINTOWN PENNSYLVANIA

Improve milling methods and Rigidmils and

Determining the most profitable processing method, then selecting the machines to suit this method—that's Sundstrand

"Engineered Production"

at work.

A high percentage of milling problems are solved with standard or semi-standard machines but, when necessary, entirely special machines will be designed and built. The important fact is: *Sundstrand designs and builds all three types of machines,* assuring you of always getting the best machine for your part design and production requirements.

These three examples illustrate the application of Sundstrand "Engineered Production" to three milling problems using: (1) a standard Rigidmil, (2) a semi-standard Rigidmil (standard machine equipped with special or multiple-spindle head), and (3) special Rigidmils. Whether your milling job is similar to any of these shown, or the part differs completely in geometry and size, the broad processing experience of Sundstrand engineers enables them to offer the most practical method for your job. Ask for a Sundstrand "Engineered Production" analysis of your milling job. There is no obligation for this service.

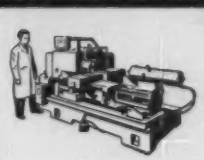
ADDITIONAL DATA on "Engineered Milling Production" is available in Bulletin No. 178. Write for your copy today.

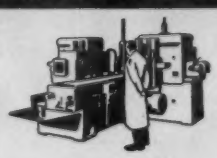
Milling Aluminum Forgings on a Standard Rigidmil

A Sundstrand Model 22 Rigidmil with standard equipment arbor mills six lugs on aluminum forgings, two in each cut of an automatic cycle that includes indexing of the work. The two-way feed table mounts a three-division index base and workholding fixture at each end, enabling operator to unload and load one fixture while the other is in cutting position. Production is 113 parts per hour.

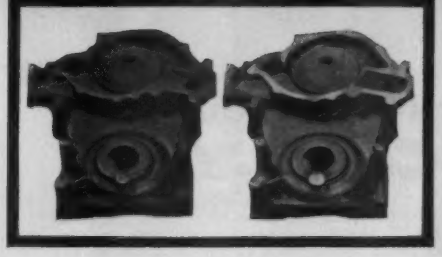
SUNDSTRAND "Engineered Production" Service* *REG. U.S. PAT. OFF.

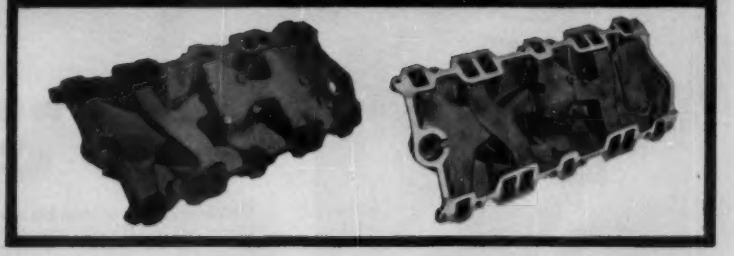
AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS





cut costs with Sundstrand "Engineered Production" service!

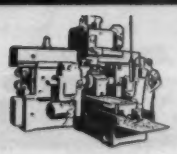


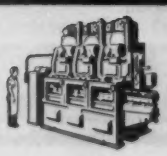


Semi-Standard Rigidmil Mills at Two Depths Simultaneously A Vertical Rotary Rigidmil equipped with special three-spindle head ruffs and finishes the large pad on this casting and, in addition, takes one cut on the small pad at a different depth. Unusual part configurations like this one shown are among the processing problems that can be overcome with semi-standard Rigidmils.

Multiple Surfaces Milled and Drilled on a Special Rigidmil The milling and drilling of port faces and bottom pads on 43 automotive manifolds per hour is performed on this multi-spindle special Rigidmil. One vertical and two angular spindles are mounted in the head bridging the table at the front. A 4 spindle vertical drill head is mounted between two 6 spindle angular drill heads at the rear. Machining operations are performed during both the forward and reverse feed strokes of the table.

TRIPLEX RIGIDMILS | SPECIAL MACHINES

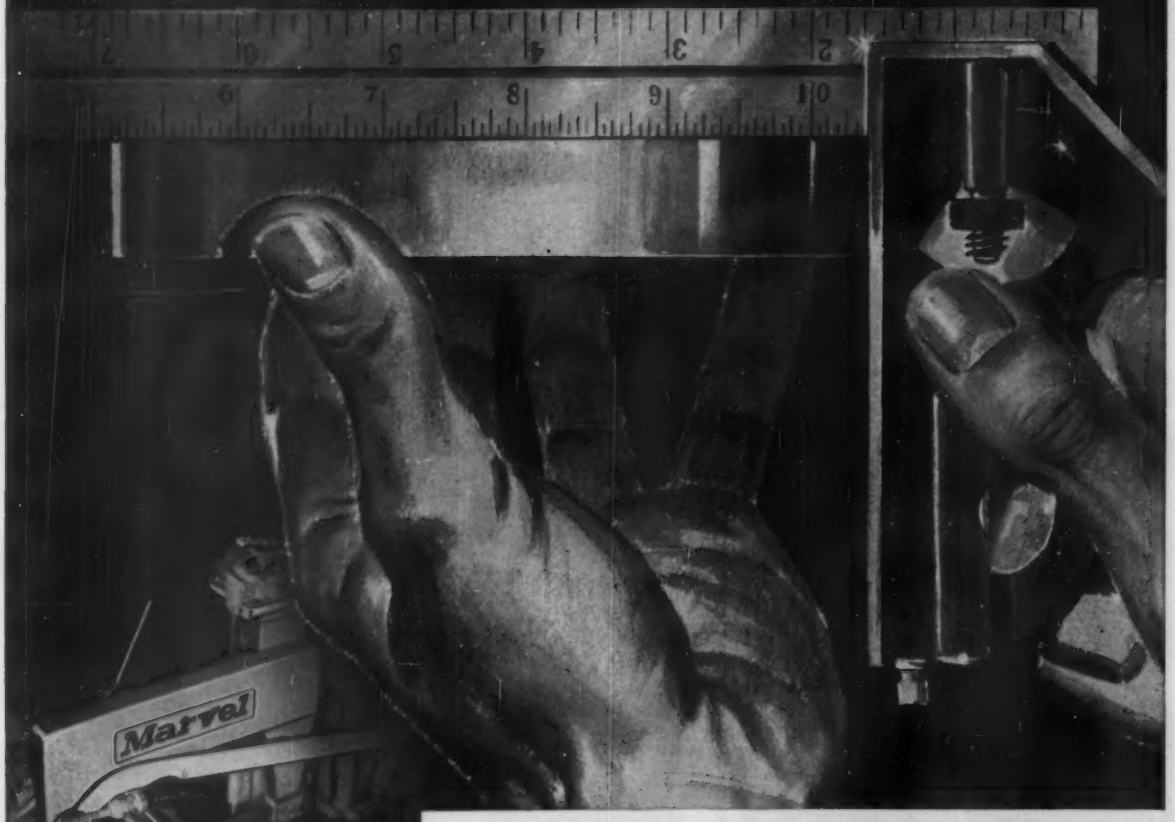




SUNDSTRAND
Machine Tool Co.
2533 Eleventh St. • Rockford, Ill., U.S.A.

A typical problem solved by
Behr-Manning "Abrasive Tech" methods

IN CUTTING-OFF OPERATIONS...



...SPEED WITHOUT ACCURACY IS COSTLY!

Efficient cut-off of steel blanks from bars demands a combination of speed *and accuracy*. MARVEL, and MARVEL alone, achieves this combination with machines capable of delivering feeds and speeds which fully utilize the strength and heat resistance of the modern high speed hack saw blade.

MARVEL dual power feed and crank lever method of reciprocation are two exclusive features designed to give increased speed and efficiency. This unique dual power feed employed on the Series No. 6 and No. 9 MARVEL Ball Bearing Hack Saw Machines, simultaneously controls both positive feed depth and feed pressure, automatically adjusting both pressure and depth of feed correctly in proportion to the number of teeth in contact with the work. This automatically forces the blade to cut as deeply as possible and practical on every stroke, without demanding the attention of the operator. As a result, the work is cut-off in the fewest possible number of strokes. Quick return of the saw frame on the non-cutting stroke, accomplished by the crank lever, delivers 33⅓% more cutting strokes per minute without increasing the blade velocity on the cutting stroke.

Accuracy is assured by the construction of the machine itself. Anti-friction ball or roller bearings are used at all load carrying points. The saw frame reciprocates on fully enclosed special design ball bearings which are factory adjusted with a pre-load, assuring permanent frictionless rigidity. Saw frame, saddle, and upright are precision machined and fitted to form a rigid integral unit capable of withstanding any cutting load with no deflection or side movement.

These exclusive features found only in MARVEL Hack Saw Machines, together with the unequalled performance of the unbreakable MARVEL High-Speed-Edge Hack Saw Blade, form a team that guarantees the fastest, most accurate cutting-off.

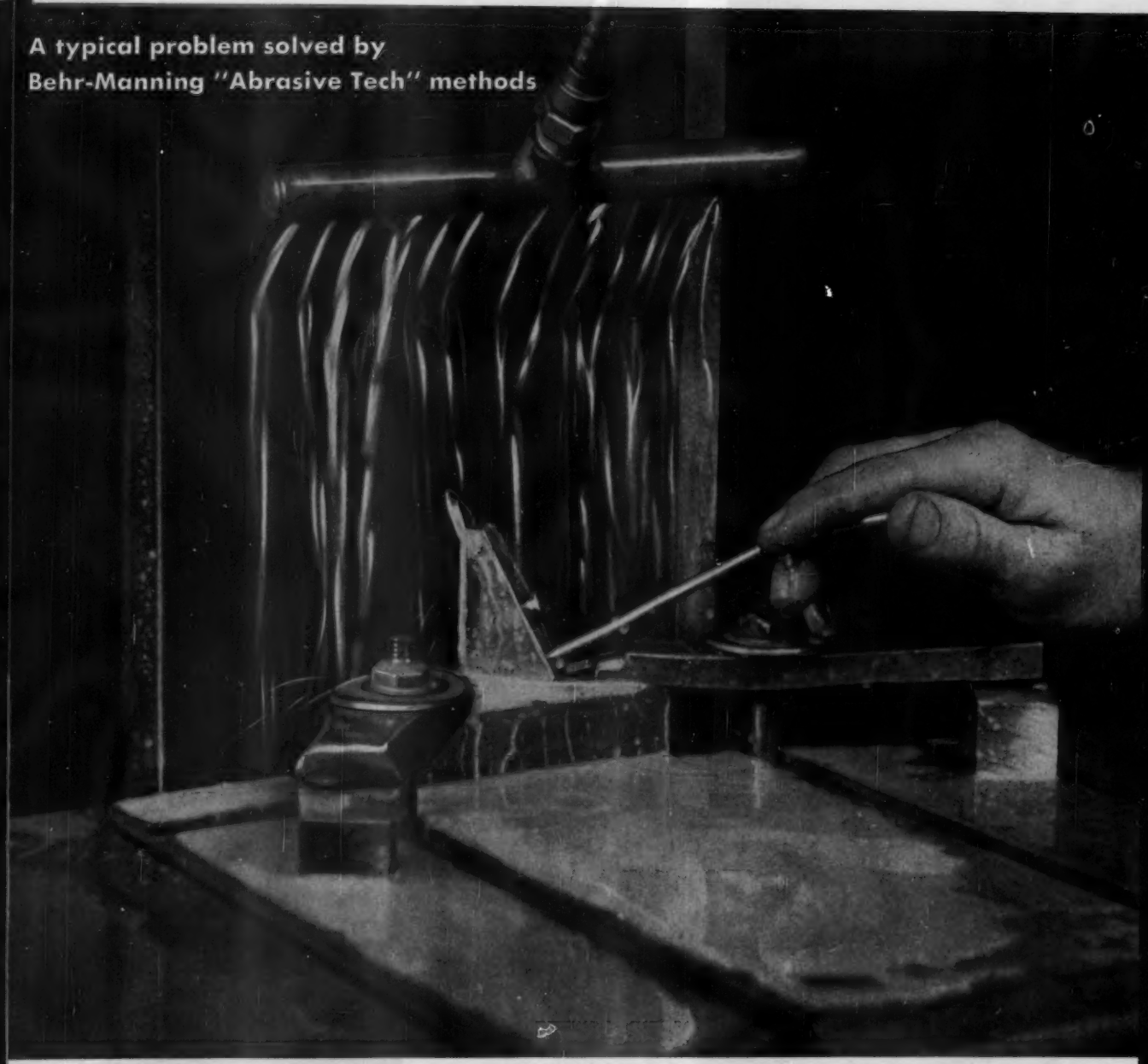
There is a MARVEL field engineer near you capable of intelligently discussing your cut-off work. Send for catalog C-55, and the name and address of your nearest MARVEL field engineer.

S-1300

ARMSTRONG-BLUM MFG. CO.
5700 WEST BLOOMINGDALE AVE. • CHICAGO 39, ILL.

Metal Cutting MARVEL SAWS
Better Machines–Better Blades

A typical problem solved by
Behr-Manning "Abrasive Tech" methods



30 minutes were cut to 18 seconds when this vertical platen belt grinder replaced a lathe in shaping boroscope mirrors. Cut at an angle from round bar stock, they need to have their bottom angle shaped to match the top angle, an operation accomplished by placing them in a fixture and rotating them against a moving Speed-wet Durite belt. This "Abrasive Tech" method is an example of the Behr-Manning technical service that may provide more production efficiency for your plant.

A Behr-Manning methods engineer can often give valuable aid in overcoming stubborn finishing problems. All you have to do is call the nearest Behr-Manning office. Seventeen well-equipped "Abrasive Tech" Methods Rooms are waiting to show you the newest techniques: Atlanta, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Detroit, Grand Rapids, High Point, Indianapolis, Los Angeles, Teterboro, Camden, San Francisco, Seattle, St. Louis, and Brantford, Canada. Main office and plant: Troy, N. Y.
For export: Norton Behr-Manning Overseas, Inc., New Rochelle, N. Y., U.S.A.

BEHR-MANNING CO.

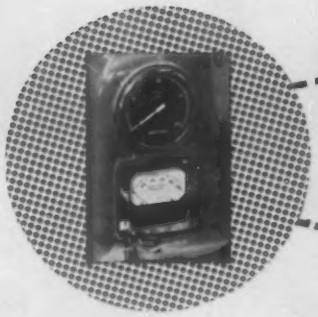
A DIVISION OF NORTON COMPANY

NORTON ABRASIVES

BEHR-MANNING PRODUCTS: Coated Abrasives • Sharpening Stones • Behr-cat Tapes
NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories

BEHR-MANNING ®

Some day every good lathe will feature



CONSTANT SURFACE CUTTING SPEED

These Monarch Lathes have it now!

Monarch Series EE—Model 1000. **1.**

Monarch Model 21 Monamatic. **2.**

Monarch Right Angle Lathe—Model F. **3.**

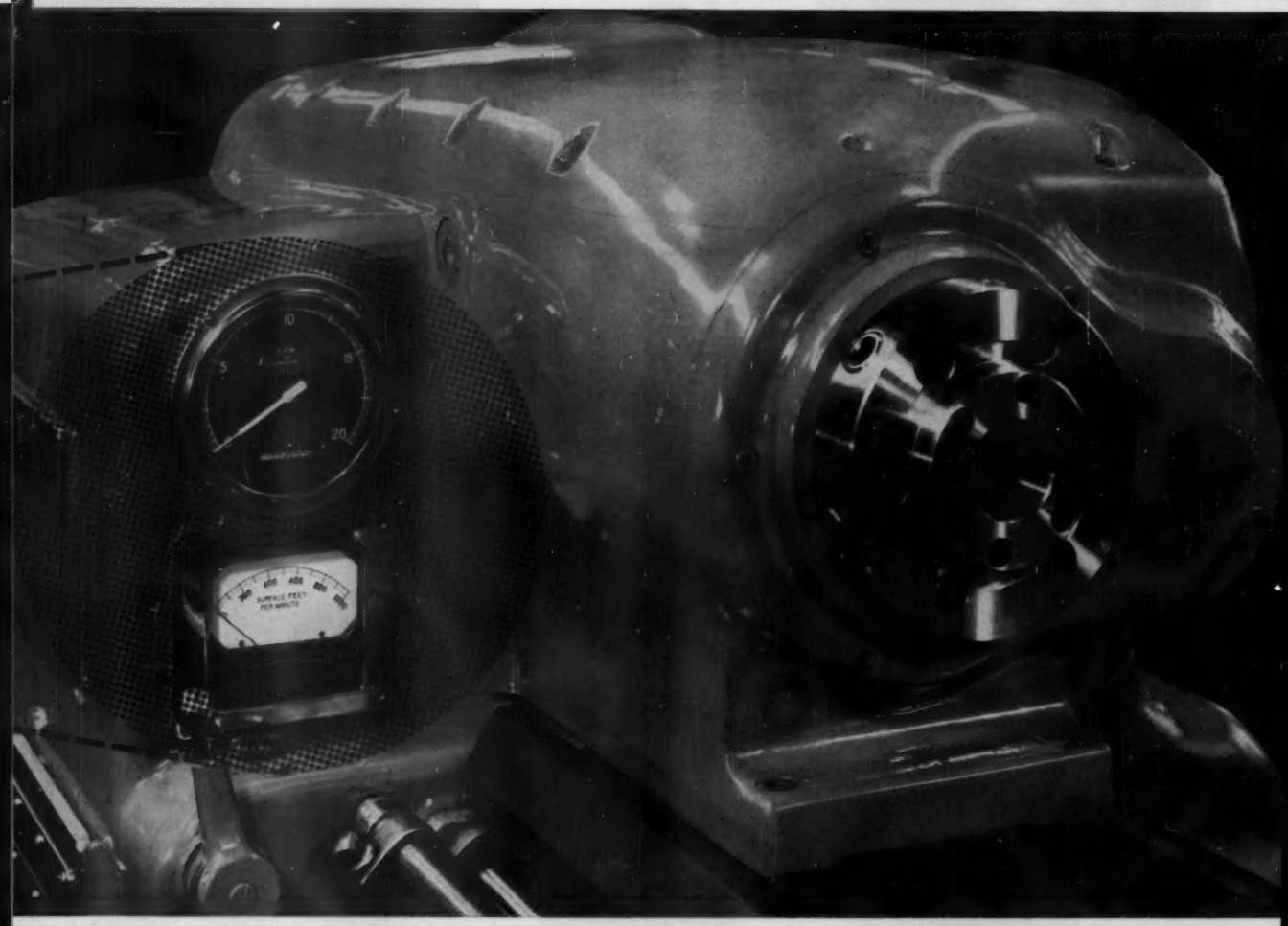
Series 61 Engine and Toolmaker's, Models M, N and NN Heavy Duty } **On special order**

Why buy obsolescence? Why buy a lathe that cut after cut, day after day can't deliver the full metal removing capacity built into it? Why buy anything less than optimum turning for today and tomorrow, both? Why buy less than Monarch?

There are plenty of reasons why you can bet on Constant Surface Cutting Speed. You've got your machine at full load throughout the cycle, increasing output from 30 to 40% on production shaft work—more on facing cuts and forgings. You're getting up to 50% more tool life, avoiding both the tool life loss of excessive speeds and the tool breakage and work distortion resulting from the increased tool forces caused by low speeds. And naturally, you get better finish and reduced power requirements.

Constant Surface Cutting Speed is the coming thing by all the laws of common sense and economics! Buy it now—buy it ahead—with Monarch . . . *The Monarch Machine Tool Company, Sidney, Ohio.*

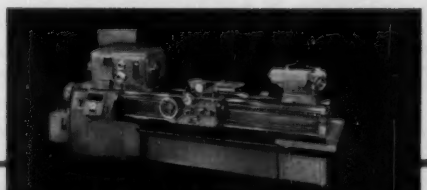
BEHR-MANNING PRODUCTS: Coated Abrasives • Sharpening Stones • Behr-Cut Tapes
NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING®



Monarch
ACCURACY • ECONOMY • LONG LIFE
TURNING MACHINES
FOR A GOOD TURN FASTER . . . TURN TO MONARCH

MONARCH DYNA-SHIFT LATHES

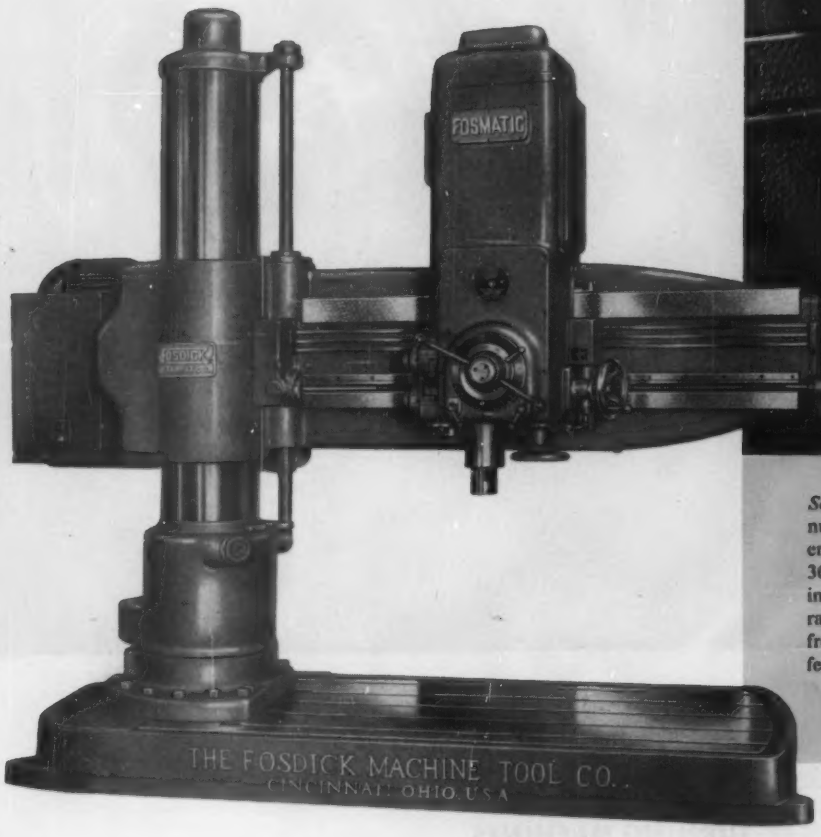
While Dyna-Shift construction does not provide Constant Surface Cutting Speed as such, it's a close approach to such an ideal—with less initial investment. Surface speeds are selected—or preselected—by dial. There is a much greater range and number of speeds. Speed shift is a matter of seconds and it's both automatic and foolproof. Look into the Dyna-Shift—with the headstock that thinks!



Monarch Series 62 Preselector Dyna-Shift

Monarch Series 80 Heavy Duty Dyna-Shift

Monarch Series 90 Heavy Duty Dyna-Shift



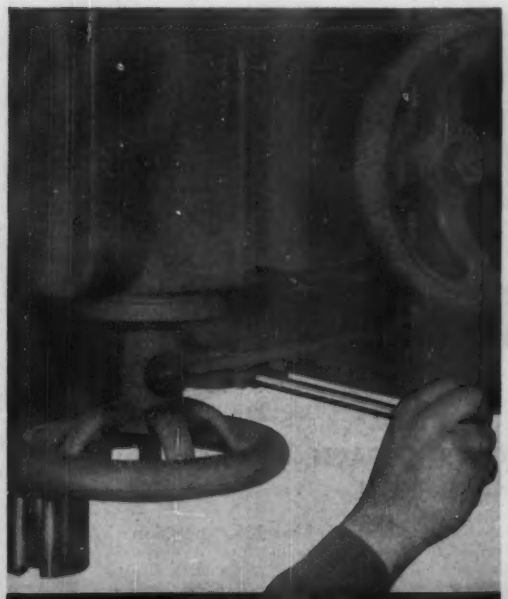
DIALS

Select feeds and speeds with easy-to-read numerical dials. Minimum possibility of error. To save time, select while drilling. 36 spindle speeds, maximum 3000 rpm, in variety of ranges, each with 127.5 to 1 ratio. 18 feeds, including 6 tap leads, from .003" to .125". Electronic milling feeds are also offered—from ¾ to 15 ipm.

FOSMATIC RADIAL

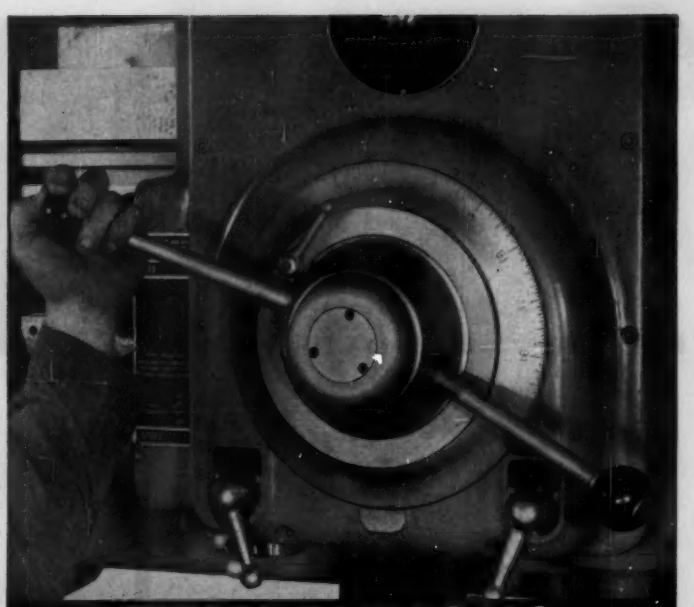
SIMPLE CONTROLS

FAST, EASY PRECISION DRILLING



LEVER

Shift, start, stop and reverse with single lever. Shifting to new feeds and speeds is accomplished by raising lever slightly in its neutral position. For faster tapping, reverse spindle speed is up to 40% faster than forward speed.



PUSH BUTTONS

Engage feed by pressing button on either quick-return handle. Feed is disengaged by depth control or by pressing either button again. Feed dial is graduated to full spindle travel, to eliminate resetting for deep holes. Powerful magnetic clutch which engages feed will never need adjusting. Head and column can be clamped automatically when feed is engaged, if desired. They are unclamped by independent levers.

Fast, rigid, precise, easy to run—that's what today's machine shop demands in a radial. And that's what makes the Fosmatic outstanding among radial drills. The simple controls shown here save valuable seconds of operator's time, with each hole drilled. Other convenient controls at the head—single lever to raise and lower arm (hydraulic clamp interlocked) and traverse head; hydraulic column clamp; hand feed and traverse to head; tool ejector eliminates need for tang driver.

The new boring-type spindle is of heavy section with bearings placed far apart for extreme rigidity; it can be used for boring, milling and the heaviest drilling. A new and unique counterbalance produces equal tension on the spindle whether it is extended or close to the head. Case-hardened gears are ground on the finest equipment available. They run on ground splined shafts which are mounted in ball bearings. Lubrication is automatic.

Our new arm is the strongest in the business. It has a double box section with very heavy walls; ways have been widened considerably. The head is mounted on roller bearings on hardened and ground ways with an additional roller support in back of the arm. Safety nut is hydraulic. Column is superfinished.

Standard sizes available with 4' to 8' arms, 13" to 19" columns. Write for Catalog RD-A.

"Engineered Production" Service FOR BROACHING

It takes all 3

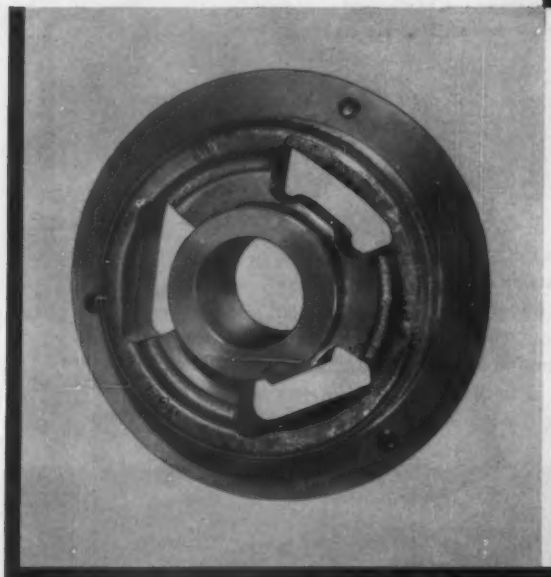
AMERICAN'S "ENGINEERED PRODUCTION" SERVICE . . . gives the broach-user the complete three-part service that is essential to obtain the most practical broaching method. Years of design and production engineering experience, unavailable at any price, are effectively added to your staff at no extra cost.

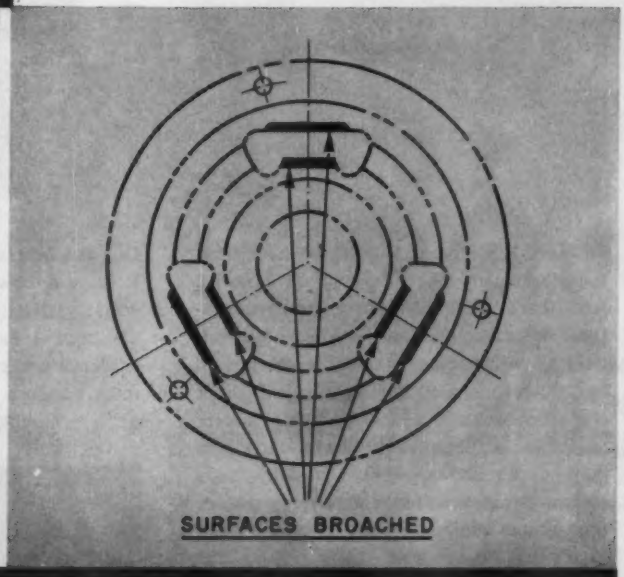
THE JOB — Broaching the flats and chamfer in the three slots of a differential center wheel. Moderate production rate required.

THE RESULT—40 completed parts per hour (a total of 120 slots) broached on a hydraulic horizontal machine. Part is indexed while broach is being returned to starting position for the next cutting stroke.

1 PROPER BROACH TOOL DESIGN

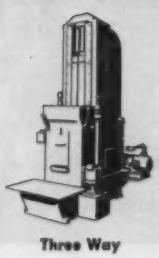
Top-quality results on any broaching operation require starting the job with design of the broaching tool itself. In solving this all-important first step, American Broach considers stock removal, length and width of cut, finish, tolerances required, etc. American's experience in designing and building broaches for every type of part capable of being broached pays off in quality of work and in long tool life. You can be sure the broach and machine will operate as a team because they are designed that way.



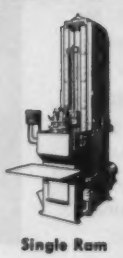


SURFACES BROACHED

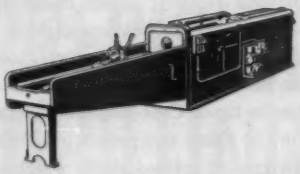
Broaching Tools



Three Way



Single Ram



Horizontal

to give you peak broaching performance

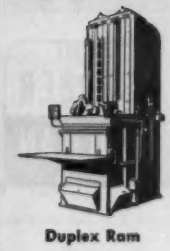
2 SPECIFYING THE RIGHT MACHINE

Production rate required, length and speed of stroke, relationship to other production machinery, and available floor space determine the selection of the broaching machine capable of doing the best job. At American, machine selection follows design of the broaching tool. Because American builds a complete line of standard machines and has extensive experience with specials, you can depend on getting the most practical machine for your job.

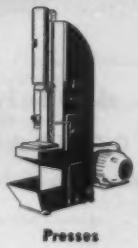
3 EFFICIENT FIXTURING

Whatever your part geometry or hourly needs, fixturing by American Broach forms the vital third link in the production chain. Whether manual loading and unloading is used or the work cycle is completely automatic, work-holding fixtures designed and built by American Broach feature easy loading and unloading coupled with positive clamping during the broaching cycle. Even with relatively inexperienced operators, production schedules are maintained since the "skills" are built into the tool, machine, and fixtures.

For more information on practical broaching methods write for Bulletin A113.



Duplex Ram



Presses

SUNDSTRAND

American

BROACH & MACHINE DIVISION

SUNDSTRAND MACHINE TOOL COMPANY

ROCKFORD, ILLINOIS

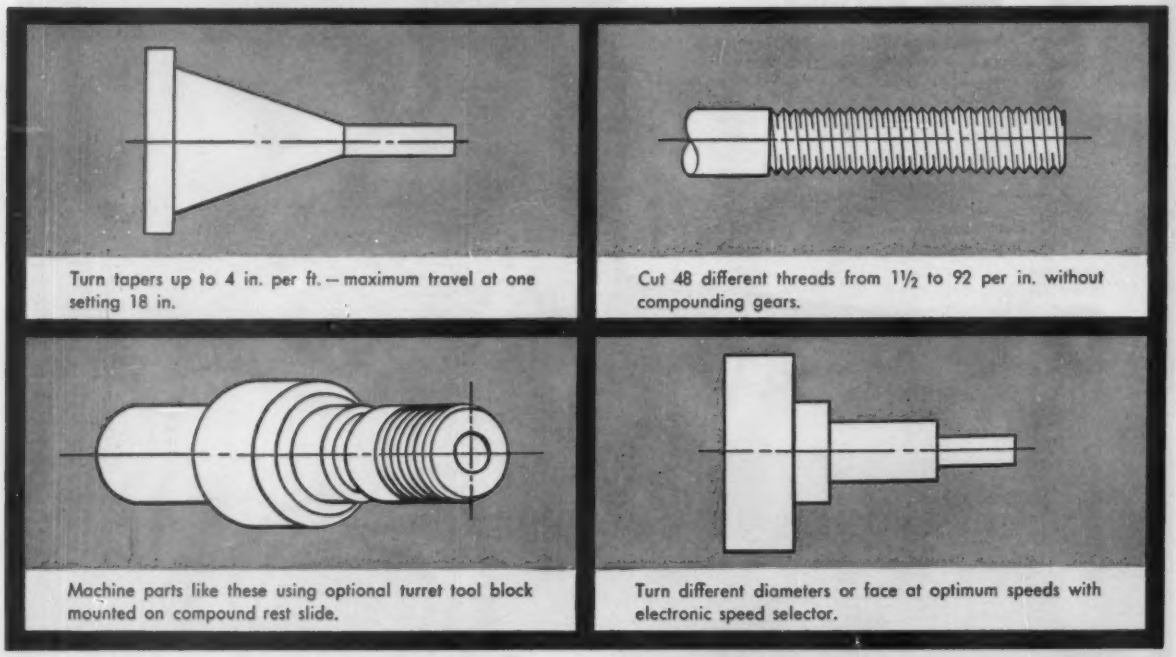
Breaching Tools | Three Way | Single Ram | Horizontal

You get

top value per dollar

with a Hendey No. 2E Lathe

do all these different jobs better, at exactly the right cutting speeds!



Turn tapers up to 4 in. per ft. — maximum travel at one setting 18 in.

Cut 48 different threads from 1½ to 92 per in. without compounding gears.

Machine parts like these using optional turret tool block mounted on compound rest slide.

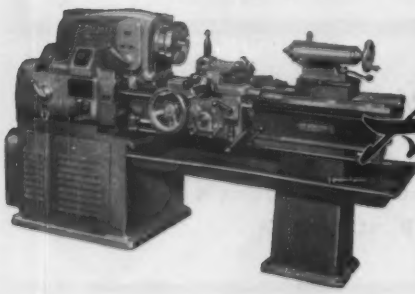
Turn different diameters or face at optimum speeds with electronic speed selector.

Tapers, threads, multiple diameters, and multiple tool-turning — they're all the same on the Hendey No. 2E.

Whatever the job, you know Hendey's infinitely adjustable electronic drive puts the right turning speed at the operator's fingertips. Every control for the cutting tool and spindle is fast, easy, and precise!

Contour turning, too, is available where required. The Hendey No. 2E 14" general-purpose lathe can be equipped *in minutes* with an optional tracer attachment. Learn how quickly this multi-feature lathe will pay for itself in your shop or toolroom. Contact your Hendey dealer for details and complete machine specifications.

for precision with production, buy Hendey



Hendey machine division

BARBER-COLMAN COMPANY

41 Loomis St., Rockford, Illinois

BARBER COLMAN ®

Unequalled barrel finishing ...with 4 different TUMBLEX* abrasives

Here are vital steps that will give you exactly the results you're looking for on deburring, descaling and finishing your products.

One is to switch from out-of-date tumbling or off-hand methods.

The other is to check Norton Tumblex materials and learn which, together with modern barrel finishing techniques, make the best combination to meet your particular requirements.

The long, expert experience of Norton engineers in developing Tumblex abrasives has brought the value-adding, cost-cutting "Touch of Gold" to barrel finishing of the widest range of products. To you, this means prompt aid in solving finishing problems. Just send sample parts, ranging from tiny needles to hefty forgings, to the Norton Sample Processing Department. You'll get helpful recommendations as to the type and size of Tumblex material to use — plus other data on the tumbling barrel equipment and operating methods you need most. **Or write, to Norton Company, Worcester 6, Mass.** for a copy of the newly revised handbook on barrel finishing. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone book, yellow pages. Behr-Manning Company, Troy, N. Y., division of Norton Company. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

G-323

ALUNDUM* Tumblex "S". Newly developed bonded spheres that easily get into areas where other abrasive shapes can't reach. Exceptionally dense and long lasting, for top barrel finishing in many applications. In five different sizes.

ALUNDUM Tumblex "T". Bonded, triangular shape, and fast cutting for special shaped parts. Triangular form prevents wedging in work slots or holes. Available in four sizes.

ALUNDUM Tumblex "A". The workhorse for general barrel finishing. Performs several operations at once, removing flash, scale, tool marks and burrs, while forming radii and finishes to required microinch. Made in eleven sizes.

Tumblex "N". Natural stones, offered exclusively by Norton, for high lustre, especially on die castings and soft metal. Rounded uniform shape brings out the most desirable color of finished parts. In seven sizes.

NORTON
ABRASIVES

Making better products... to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels Grinding Machines • Refractories
BEHR-MANNING PRODUCTS: Coated Abrasives Sharpening Stones • Behr-cat Tapes

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

A new line

RYK

Major breakthrough in grease technology results in development of new thickening agent. New grease has greater high temperature stability, superior multi-purpose qualities, improved lubricating properties.

Check Chart Of RYKON Greases

Regular Line	Grade Consistency
RYKON Grease No. 0....	0
RYKON Grease No. 1....	1
RYKON Grease No. 2....	2
RYKON Grease No. 3....	3
Heavy Duty Line	
RYKON Grease No. 0 E. P.	0
RYKON Grease No. 1 E. P.	1
RYKON Grease No. 2 E. P.	2

STANDARD

STANDARD OIL COMPANY (Indiana)

of Standard Oil greases

ON GREASE

Standard Oil instituted a grease research and development project several years ago. The result of this work is the line of RYKON Greases, which contain a new non-soap, organic thickener.

RYKON Greases surpass in stability and performance the best greases made up to this time. They bring to industry new opportunities for improved machine performance. They greatly reduce maintenance and grease handling problems.

RYKON Grease Properties

RYKON Greases are smooth, buttery-textured greases, made from the finest quality, solvent-extracted oil. Their thickening agent is a Standard Oil exclusive. RYKON Greases have these high-quality characteristics:

High temperature stability — Better heat stability than any other petroleum oil grease. ASTM dropping point of 480°F. Maintain consistency in service at high temperatures.

Mechanically stable — Maintain consistency even under severe mechanical working.

Chemically stable — Inhibit oxidation. Oil and thickening agent in combination possess extremely good chemical stability.

Oil separation — Minimum bleeding of oil in service and storage.

Wide temperature range — Lubricate at high and low temperatures. Extended range of application thus obtained makes RYKON Greases truly multi-purpose.

Water resistance — Do not lose consistency in presence of water. Resists water washout.

Anti-rusting — Exceptional natural rust preventive characteristics.

With RYKON Greases, lubrication can become simple, foolproof and less expensive—much less expensive, perhaps, than a single shut down caused by equipment failure due to the use of the wrong grease or the use of an "economy" grease.

RYKON Greases come in four Regular and three Heavy-Duty grades. Thus there is a RYKON Grease to take care of every grease lubrication job. Using RYKON Greases plant-wide can reduce your grease storage requirements, simplify lubrication maintenance training, cut down record keeping, save on dispensing equipment and reduce investment in grease inventories.

Get more facts about RYKON Greases. Call your nearby Standard Oil industrial lubrication specialist in any of the 15 Midwest or Rocky Mountain states. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

"Galvanized Sheets produce a quality product,"

Another difficult forming operation for USS GALVANIZED STEEL SHEETS. At the hopper edge the sheet makes a tight curve around a ¼-inch round.

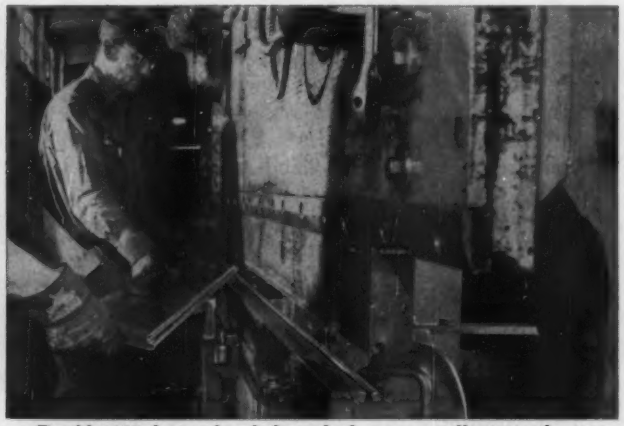
says **W. A. Hyland,**
Chief Product Engineer,
John Deere Van Brunt Company,
Horicon, Wisconsin

"We are interested in giving our customers a quality implement that will give years of satisfactory service without the need of a lot of attention. Galvanized Steel Sheets weather well; the implement has good appearance after years of service and commands a better trade-in allowance."

John Deere Van Brunt Company manufactures a great variety of farm equipment. In the accompanying pictures you will see USS GALVANIZED STEEL SHEETS being formed into a hopper for a grain drill.

USS GALVANIZED STEEL SHEETS do the job best. The smooth, even coating of zinc on USS GALVANIZED STEEL SHEETS is highly resistant to flaking, chipping, and cracking even under tough conditions of cutting, bending, stamping, rolling, welding, soldering or forming. For more information, get in touch with the nearest District Sales Office of United States Steel.

Fertilizer holes are punched into drill hopper, fabricated of USS GALVANIZED STEEL SHEETS.



Double 180-degree bend, for a lock seam, really tests the non-flaking properties of USS GALVANIZED STEEL SHEETS.

USS GALVANIZED STEEL SHEETS

UNITED STATES STEEL CORPORATION, PITTSBURGH · COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

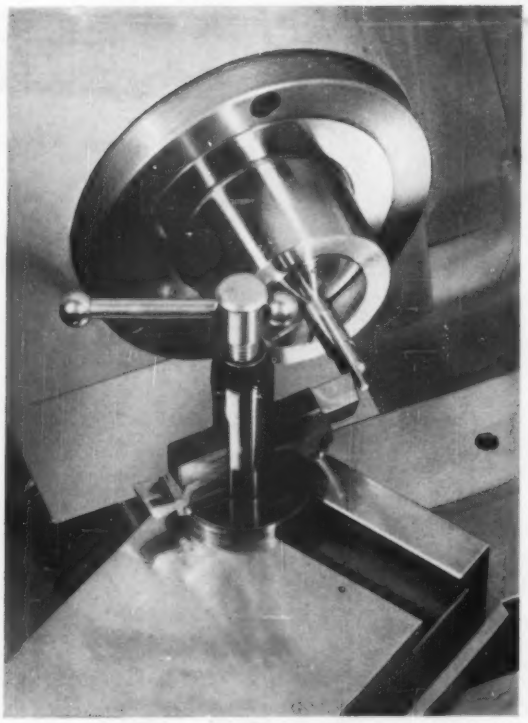
UNITED STATES STEEL

Blast that scale

For speedy, low cost scale removal, pressure blast with BLASTITE® Abrasive Grain by CARBORUNDUM. BLASTITE® is fused aluminum oxide . . . particles are sharp, *tough* and durable. BLASTITE® is unaffected by moisture, does not clog equipment and leaves no residue. Surfaces prepared with BLASTITE® require less priming. For more information, ask your CARBORUNDUM Distributor or Salesman. Or write The Carborundum Company, Niagara Falls, New York, and ask for Booklet No. 14. In Canada: Canadian Carborundum Company, Ltd., Niagara Falls, Ontario.

Ask the man from **CARBORUNDUM** REGISTERED TRADE MARK **ELECTRO MINERALS DIVISION**

CARBORUNDUM . . . also makers of a complete line of Bonded and Coated abrasives



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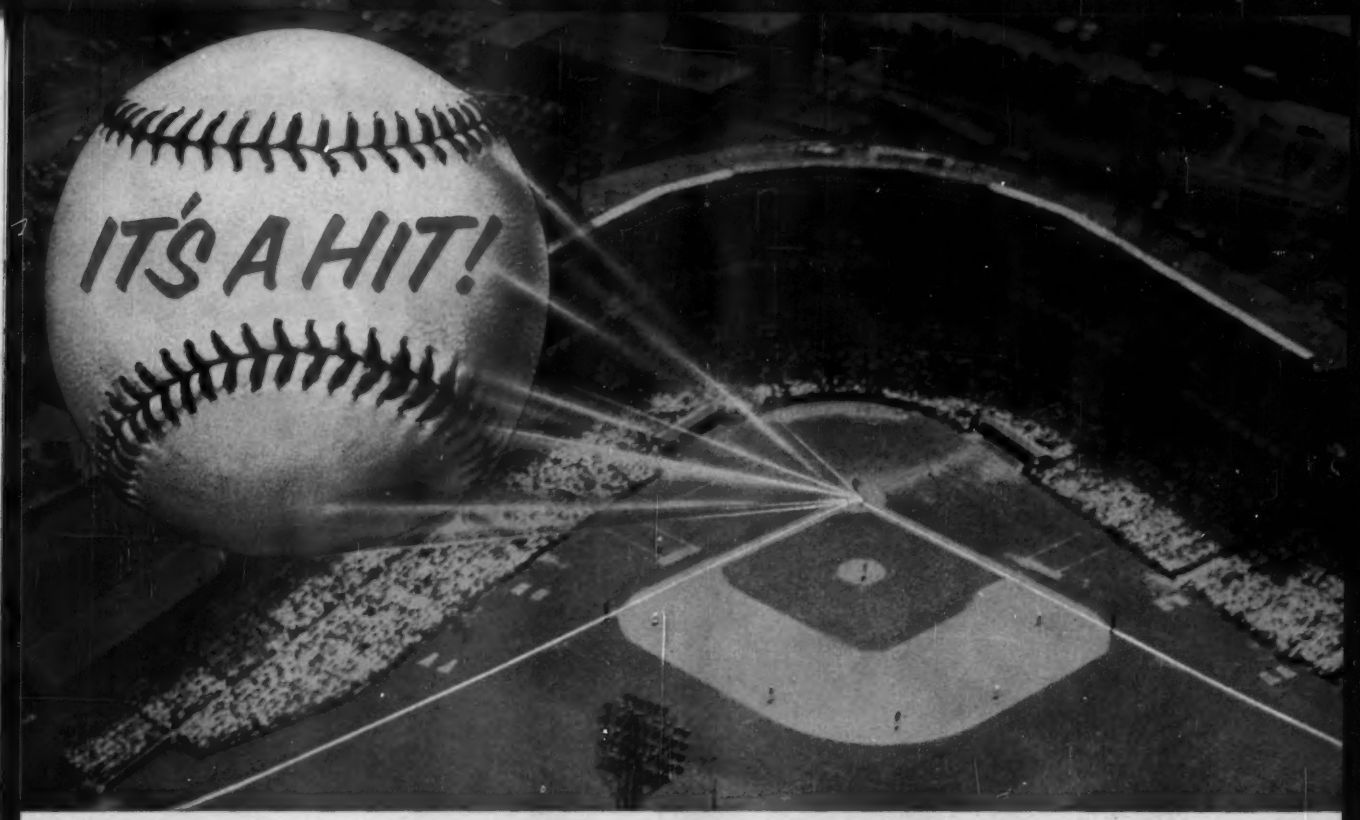


How to IMPROVE your production BATTING AVERAGE

You'll lead the league when you switch to CIMCOOL®, the radically new and different cutting fluid. Here are three ways that CIMCOOL Standard Concentrate can improve your production batting average:

- **CIMCOOL LOWERS COST** because it's longer lasting in machines. Thus, it reduces downtime and cuts labor costs for cleaning and changing.
- **CIMCOOL IMPROVES TOOL LIFE** because of its chemical lubricity. It permits faster speeds and feeds, for it combines friction reduction and cooling capacity in a degree never before attained by old-fashioned coolants.
- **CIMCOOL IS CLEAN,** doesn't soil clothing or hands. It contains no skin irritants. It leaves no slippery film on shoes, floors, machine or work. It can't smoke, can't burn, and virtually eliminates rancidity and foul odors.

For full details on CIMCOOL Standard Concentrate—and on the entire family of CIMCOOL Cutting Fluids—just contact us. Wire, write or telephone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

*Trade Mark Reg. U.S. Pat. Off.

CIMCOOL CUTTING FLUIDS

CIMCOOL	**Concentrate**—The famous pink fluid which still covers 85% of all metal cutting jobs. Effective, economical and clean.
CIMCOOL	**Tapping Compound**—Permits the use of highest tapping speeds and increases tap life amazingly.
CIMPLUS	The transparent grinding fluid with exceptional rust control. Also used for machining cast iron and as a water conditioner with CIMCOOL Concentrate.
CIMCUT	**Concentrates** — For jobs requiring oil-base cutting fluids. Added to mineral oils, they give economical mixes for higher speeds and feeds.
CIMCOOL	**Bactericide** — The most effective agent yet developed to overcome rancidity and foul odors.
CIMCOOL	**Machine Cleaner** — The two-phase non-corrosive cleaner that removes grit, dirt, slime and oil.

CIMCOOL Cutting Fluids

for 100% of all metal cutting jobs

PRODUCTION-PROVED PRODUCTS OF THE CINCINNATI MILLING MACHINE CO.

Take it from the early birds...

"IT'S THE GREATEST

Niagara Series E 4½ OBI Press in operation at a well known eastern commercial stamping plant. Work includes stamping small wrenches; trimming canopies for electrical fixtures; piercing, cutting off and forming saddles with a progressive die (shown).

Niagara Series E 4½ OBI Press engaged in blanking and drawing of kitchen cannister lids from half-hard aluminum at midwestern housewares manufacturing plant.

"we can produce from 8,000 to 10,000 pieces in an eight hour day"

"much safer press"

"takes less floor space"

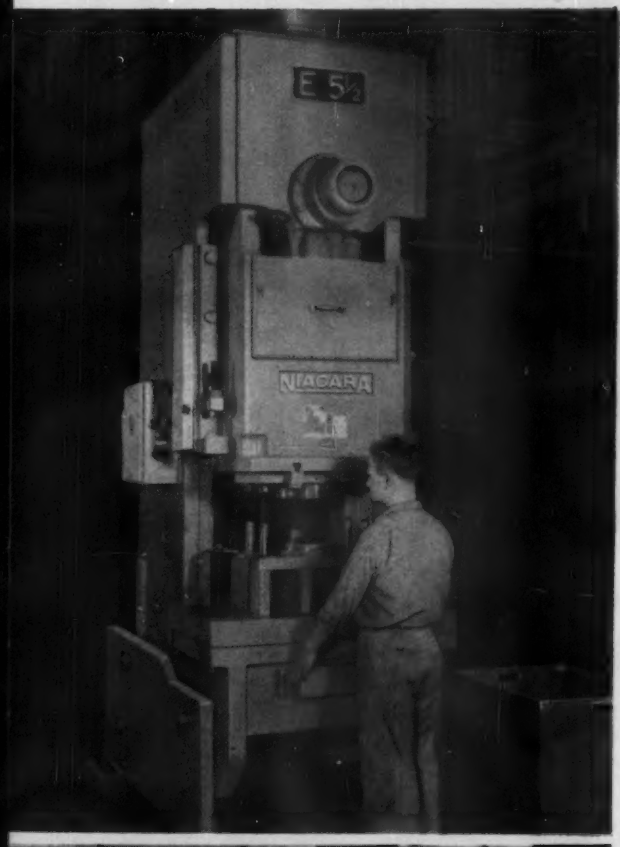
"has a centralized pressure lubricator which we like very much"

O.B.I. EVER BUILT"

"we find that dies without posts work much better on this press"

"all dies give better and longer runs"

"large slide area for large trimming, blanking and progressive dies"



Niagara Series E 5½ OBI Press forming and trimming hemispherical copper parts for one of the "Big Two" electrical manufacturers.

Few developments in metalworking history have drawn the enthusiastic endorsement given Niagara's revolutionary Front-to-Back Crankshaft OBI Press.

Now, as at the 1955 Machine Tool Show where it was unveiled, there is *nothing* even remotely resembling it in the industry... design-wise and production-wise.

Customers in U.S. and Canada... the "early birds" who are doing their modernizing with the most modern press of all... can today tell you about accomplishments with this newest and greatest of OBIs that you would have never dreamed possible. Yes, the press that Niagara conceived to do more than any OBI ever built is doing just that for a fast-growing list of metalworking plants.

There's a huge fund of successful experiences that a Niagara representative can share with you today. Draw on it now and utilize it in your modernization plans. Make a date, at your convenience, for a personal call.

...and if you haven't received new Bulletin 56 with complete design description and specifications (75-200 ton capacities, 4½-7½ inch shaft diameters, standard and automated models) write for your copy at once. You will find it invaluable to your planning.

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America's most complete line of presses, press brakes, shears, other machines and tools for plate and sheet metal work

NIAGARA

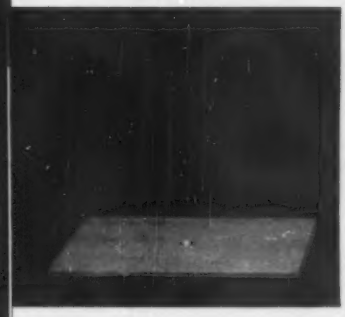
front-to-back crankshaft INCLINABLE PRESSES

fixtures; piercing, cutting off and forming saddles with a progressive die (shown).

Why remove metal when you can move metal

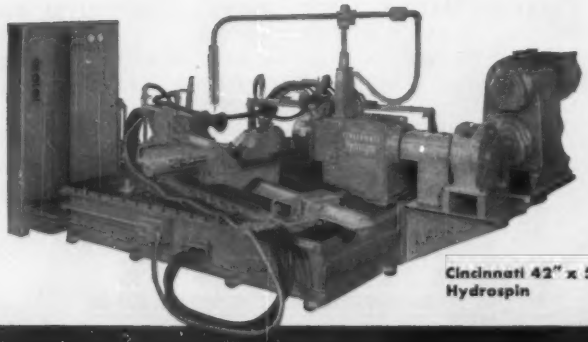
31" long

into the shapes you want with the Cincinnati Hydrospin



14" high

A wide range of parts can be produced quickly and at low cost by "*chipless machining*" on the Cincinnati Hydrospin. Less metal is wasted and parts have accurate dimensions, high strength and good finish. Let a Process Machinery Division field engineer give you full details. For a description of the process and machine specifications, write for Bulletin M-1873-3.



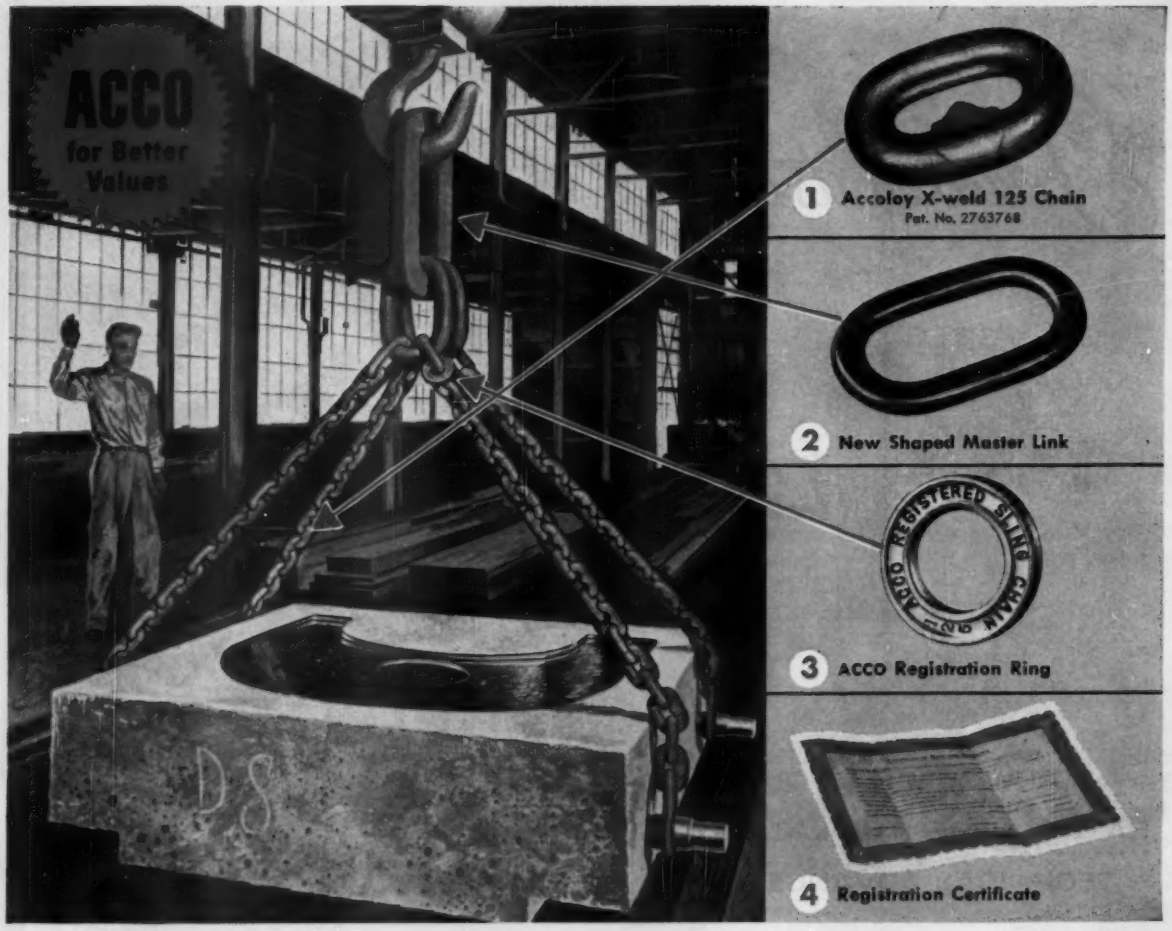
Cincinnati 42" x 50" Hydrospin

✳ Upper sequence of photos shows *one continuous* tube spinning operation. Starting blank, far left, of SAE 4130 is 8¾" long x 3"I.D. x 0.155" wall thickness. Finished part, shown at far right, Hydrospun in one pass, is 31" long x 3" I.D. with 0.030" wall thickness.

✳✳ Lower sequence of photos shows *one continuous* shear spinning operation. Starting blank, far left, is of type 302 stainless steel, 12" square x ¼" thick. Finished part, shown at far right, Hydrospun to a 32° included angle in one pass, is 14" high with 0.069" wall thickness.

CINCINNATI **Hydrospin**

PROCESS MACHINERY DIVISION
THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO, U. S. A.



You get all these "plus values" in Acco Registered® Sling Chains

• When you equip your plant with ACCO *Registered* Sling Chains, you are getting slings of such *proved safety and efficiency* that they are the standard by which all other slings are judged! And, in addition, you get all these important, exclusive "plus values":

1 Accoloy X-weld 125 Chain • Where extra strength is desired in an ACCO *Registered* Sling Chain, the patented new Accoloy X-weld 125 Chain is used. Its king-sized welded area and non-kinking feature assure greater ruggedness and better service at no increase in price.

2 New Shaped Master Link • ACCO engineers have created the new Shaped Master Link which, without any increase in weight, holds its form under loads up to 18% greater than a standard round section can. This means extra security for your loads.

3 ACCO Registration Ring • The presence of this serially-numbered ring on an ACCO *Registered* Sling Chain shows that each component has been tested before assembly . . . that the assembled sling has been proof-tested to twice its working load limit . . . and that all tests have been successfully passed before registration of the complete sling and shipment from the factory.

4 ACCO Registration Certificate Every buyer of an ACCO *Registered* Sling Chain is furnished with a Registration Certificate signed by American Chain & Cable Company, Inc. This Certificate gives assurance that the sling meets ACCO's severe requirements of quality and proof-tested performance, and that it has been individually registered on ACCO's permanent records.

Tops in safety and strength

ACCO *Registered* Slings, with *Magnaflux-tested hooks*, give the best in strength, safety, service—and long-range economy. They are available through ACCO *Registered* Sling Chain Distributors in principal industrial centers. For full data, write us at York, Pa.

WHAT "ACCO REGISTERED" MEANS

1. The best material
2. Unit safety factor (on bodies, rings, links, hooks)
3. Proof test of complete sling to twice the working load limit
4. Actual field service test of each design
5. Metal identification ring on each sling
6. Signed Registry Certificate with each sling

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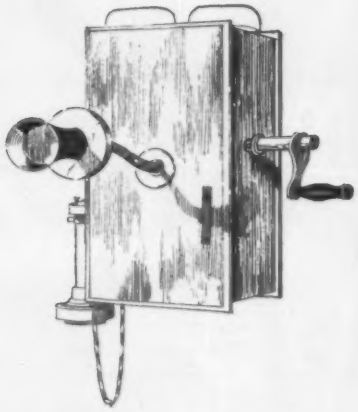
Great in its day...



BUT WOULDN'T YOU
RATHER HAVE THE LATEST
TECHNICAL ADVANCE?

Now...

another significant advance in a great tool line

Heller "Job Tempered" Flat Ground Die Steel

Heller's new JOB TEMPERED Flat Ground Die Steel is a truly significant advance in the field.

For one thing, its analysis is recommended by a group of leading consulting metallurgists. For another, it is precision-ground to a smooth surface finish of 25 to 35 micro-inches with all surface defects and decarburization removed to save time and effort in tool making.

It's easy to heat-treat, too. For instance, Heller Oil-Hardening Die Steel will achieve a Rockwell C hardness of 64-65 when hardened within a temperature range of 1450°F. to 1540°F. And a similarly wide range applies to the Air-Hardening type. Simple tempering instructions are supplied with each piece, so the entire heat-treating process is non-critical and virtually foolproof. As a result, you are sure of getting all the benefits of JOB TEMPERED tools, dies, jigs and fixtures when they're made from this superior Heller Die Steel.

Check the Die Steel or Tool Steel you may be using now.

Then let us show you why Heller JOB TEMPERED Die Steel is more efficient and economical to use . . . and will turn out tools that will do the job better and last longer.

Here are the Facts!

Heller's new folio of JOB TEMPERED Flat Ground Die Steel will give you full information on sizes and types available, heat treating, applications, physical properties, etc.

Write today for your copy.

. . . the analysis recommended by leading consulting metallurgists for Job Tempered Tools and Dies

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Heller DISTRIBUTORS
"YOUR OUTSIDE TOOL ROOM"

Heller "Job Tempered" Tools

star performer

...and among high speed steels

REX is the leader

Crucible REX® high speed steel has been the winner in shop tests for more than fifty years. *And now REX is even better than ever!* For Crucible research and experience has led to improved manufacturing techniques that mean higher quality – greater uniformity.

Prove the superiority of REX for yourself – on your next job. Check it for size, structure, response to heat treatment, all-around tool performance. Then you'll know why REX has always been the *standard by which other high speed steels are compared.*

REX is immediately available at all of Crucible's convenient warehouses – or through prompt mill delivery. For a list of available data on REX and other Crucible *special steels*, write for a free copy of the "Crucible Publication Catalog". *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

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We eliminated the need for drill jigs with a

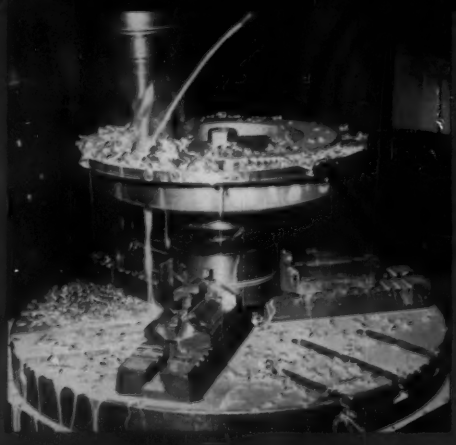
BULLARD

Spacer Table

One of the leading manufacturers of machinery and equipment for the mining industry, employs the Bullard Spacer Table to locate parts for drilling, reaming and tapping.

According to the Assistant Factory Superintendent, "the Bullard Spacer Table eliminates the need for layout and is more accurate thereby saving jig cost and re-work time."

If you drill, ream or tap in your manufacturing, it will pay you to investigate the advantages of a Bullard Spacer Table.



. . . . . Call your nearest Bullard Sales Office or write

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BRIDGEPORT 9, CONNECTICUT

YOUNGSTOWN QUALITY PAVES THE WAY

Producers of Quality Carbon and Alloy Steels for over Half-a-Century

The Motor Grader and Tractor-Scraper—shown working on the site of Houston's multi-million-dollar "Shopping City of Gulfgate", are designed for rugged service requiring tough strong steel construction.

Caterpillar Tractor Co. uses Youngstown quality steels in the construction of these powerful machines. Youngstown Alloy Steel for the gears of the steering and driving mechanisms help to provide durable, trouble free mechanical operations. Yoloy "M" Steel Plates, one of the Yoloy family of high strength steels, are used for structural strength, resistance to shock and abrasion and also for ease in forming and welding the many intricate parts in this type of fabrication.

Youngstown's Alloy and Yoloy Steels are produced in a variety of forms and qualities to meet your particular specifications. Our Service Engineers are available upon request to discuss your Alloy and High Strength steel problems—why not call them today.

THE YOUNGSTOWN SHEET AND TUBE COMPANY

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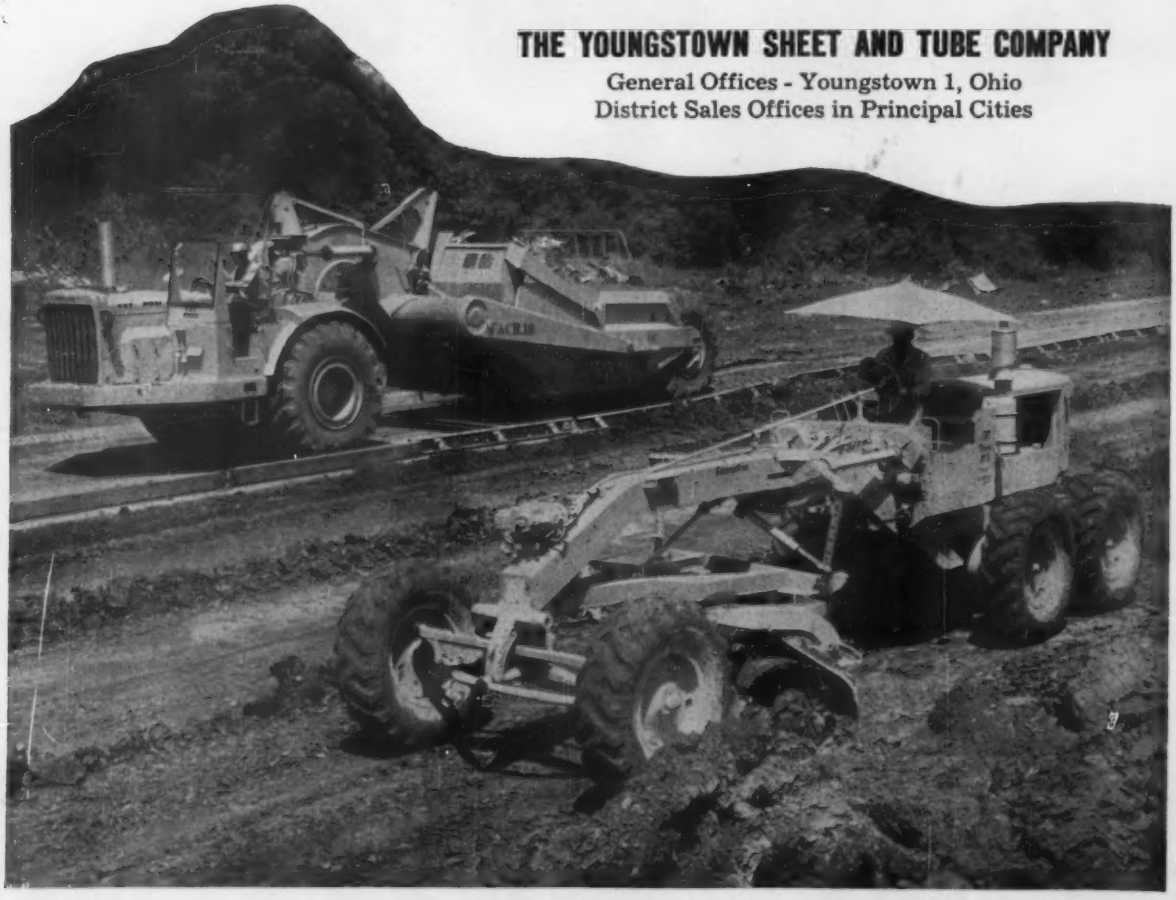
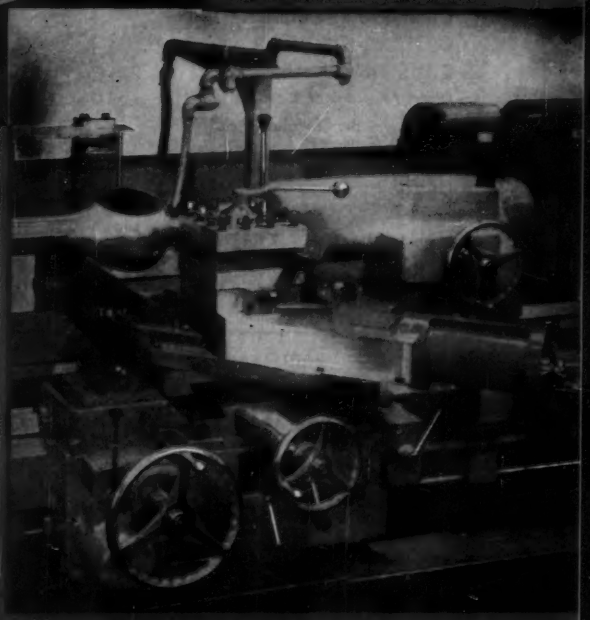


2 hrs. versus 9½ hrs.



This marine Diesel engine connecting rod is now roughed and finished from the rough forging in exactly 2 hours. It formerly required 9½ hours to do the same job.

With production costs constantly reaching new peaks, industry simply can't afford to ignore such savings from modern equipment. Where else could such a magnificent return upon an investment be secured, and how else can costs be lowered to meet an increasingly competitive market?

More production per man hour is the answer and the only answer to prohibitive costs—modern, high production machinery is the answer to greater production per man hour.

The astounding saving on this connecting rod job is the result of transferring it from previous equipment to a new 32-inch "AMERICAN" Hydraulic Duplicating Lathe. Such savings as this are not the exception but the rule when "AMERICAN" Duplicators are put on the job.

Bulletin No. 35 shows many such examples—it's yours for the asking.

THE AMERICAN TOOL WORKS CO. **Cincinnati, Ohio U.S.A.**

Lathes and Radial Drills

dixi 60

horizontal optical jig borer

with 5 optical microscopes

DESIGNED AND BUILT FOR:

VERSATILITY
Optical settings for operations in all planes and compound angles . . . Equally suitable for tooling, short-run or production work . . .

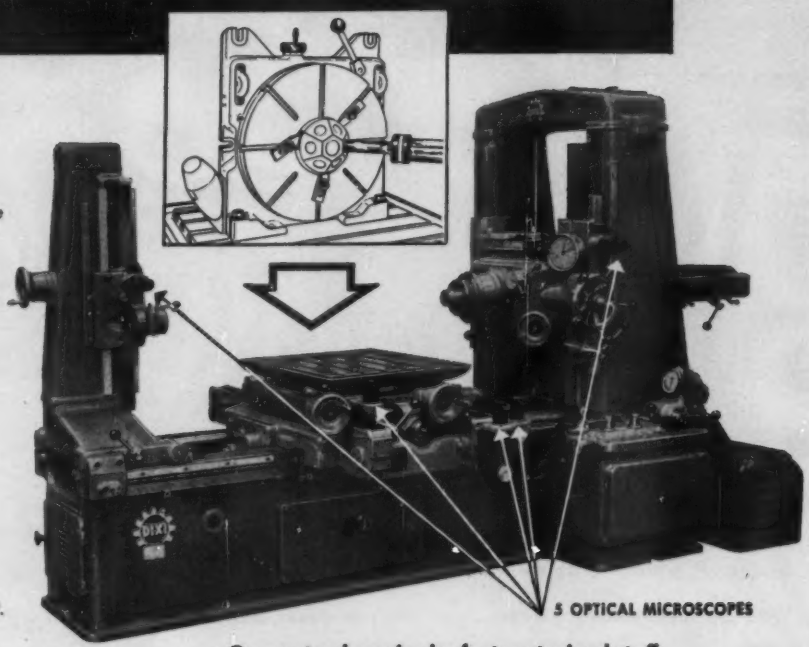
ACCURACY
Overall accuracy of .0002"

A precision machine for *JIGLESS* boring, facing, milling, and drilling work, in all planes. Built-in 360° optical rotary table, 28¾" x 32¾". All spindle and table settings by optical microscopes. Infinitely variable hydraulic feeds. Mechanical spindle feeds with automatic depth stop. #40 taper spindle-speeds infinitely variable to 1400 R.P.M. Special features eliminate effect of spindle overhang on accuracy.

DIXI 450 PRECISION OPTICAL CIRCULAR DIVIDING TABLE

Direct readings of 1 sec.

(See insert picture above) rigidly mounted (not tilting) on built-in rotary table permits holding close tolerance relations between bores in all planes, including bores at compound angles. ALL IN ONE SET-UP. All sides of the work piece except the mounting face machined in one set-up.



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- ***Engineering staff available for consultation***
- ***Spare Parts in New York stock***
- ***Your operators trained***

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Names available upon request.

SEE THIS VERSATILE MACHINE IN OPERATION

at our New York or Cleveland Show Rooms. Write for Complete descriptive literature and prices to Department 21. Catalogues on additional production equipment also available on request.

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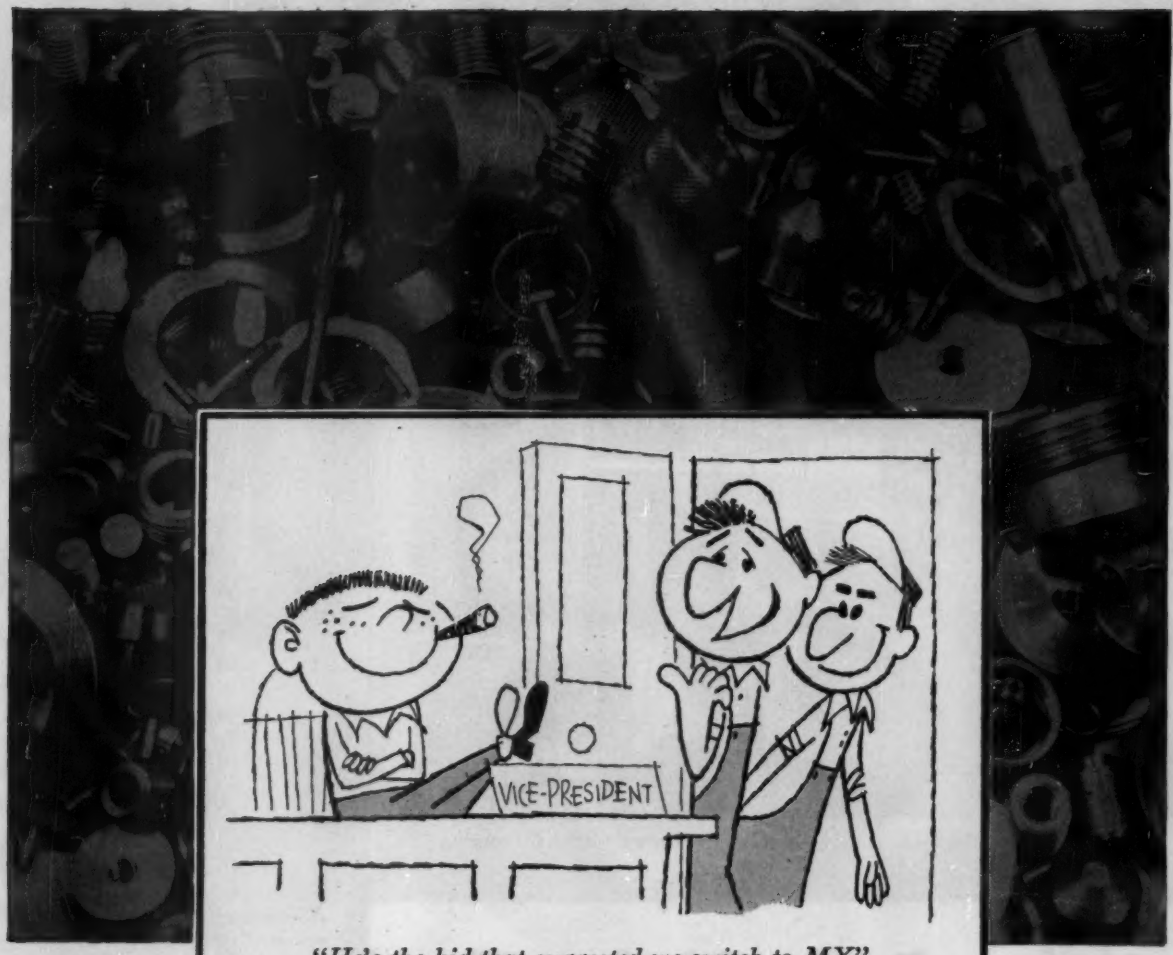


"He's the kid that suggested we switch to MX"

A switch to USS Free-Machining MX Steel can have some remarkable results. Your production rates will take a jump—increase up to 50% or more depending on the job . . . your tools will last longer, often twice as long . . . machine down time will be reduced . . . your parts will have cleaner, sharper finish . . . dimensional accuracy will be easier to maintain . . . you'll have fewer rejects.

And, because MX sells at the same price as regular screw stock grades, your production costs will be lower.

Hundreds of progressive shops that have put this faster-cutting screw stock to work have proved this to be true. Based on the cost reductions they report, which average between 10 and 15% and have sometimes run as high as 42%, we feel confident that MX will cut the cost of any part you now machine from regular screw stock. The more machine work required, the greater your savings will be.

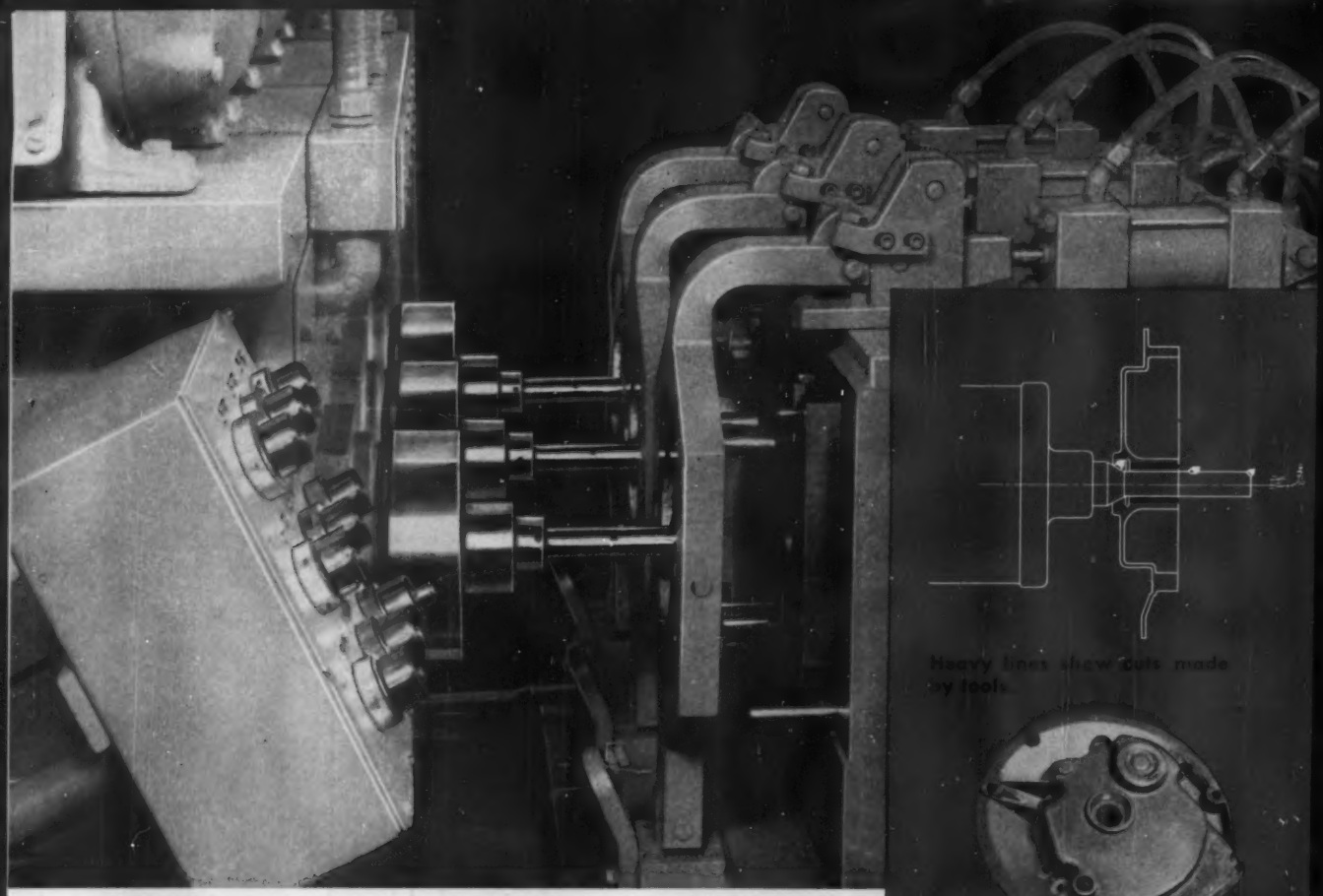
USS Free-Machining MX Steel has been successfully machined at speeds up to 350 SFM. It is produced in all the popular screw stock sizes and is available in both Bessemer and Open Hearth grades. You can buy it in cold-finished form from your regular supplier, either as "MX" or under his own identifying trade name. In hot-rolled form, MX is available through our nearest sales office. Why not give it a try?

UNITED STATES STEEL CORPORATION, PITTSBURGH
AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION
WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

More parts... better parts... at lower cost per part

USS *—when you do the job with free-machining* **MX**

UNITED STATES STEEL



Close-up view of the three-station work fixture. Note hydraulic clamping arrangement.

3 Parts Every 36 Seconds

A large manufacturer of appliance components slashed production costs with a standard Ex-Cell-O Boring Machine. The machine rough and finish bores and counterbores the central holes in aluminum mounting flanges at the rate of *3 parts every 36 seconds!* That's 5 parts per minute!

The machine that performs this operation is the Ex-Cell-O Style 112-D, a hydraulically-operated single-end boring machine. Rugged and versatile, this machine uses one or more spindles for rotation of either the part or tools for accurate boring of a wide variety of medium and large-size parts. With the right tooling, this standard machine can handle both large and small production runs, or can be adapted to a completely automated installation!

This type of machine can make a big difference in your production figures. To find out *how much* difference get a quotation from your Ex-Cell-O representative.

Heavy lines show cuts made by tools.

Aluminum mounting flanges automatically bored on this Ex-Cell-O Boring Machine.

Full view of standard Ex-Cell-O Style 112-D Precision Boring Machine, built for extra production.

EX-CELL-O
CORPORATION
DETROIT 32, MICHIGAN

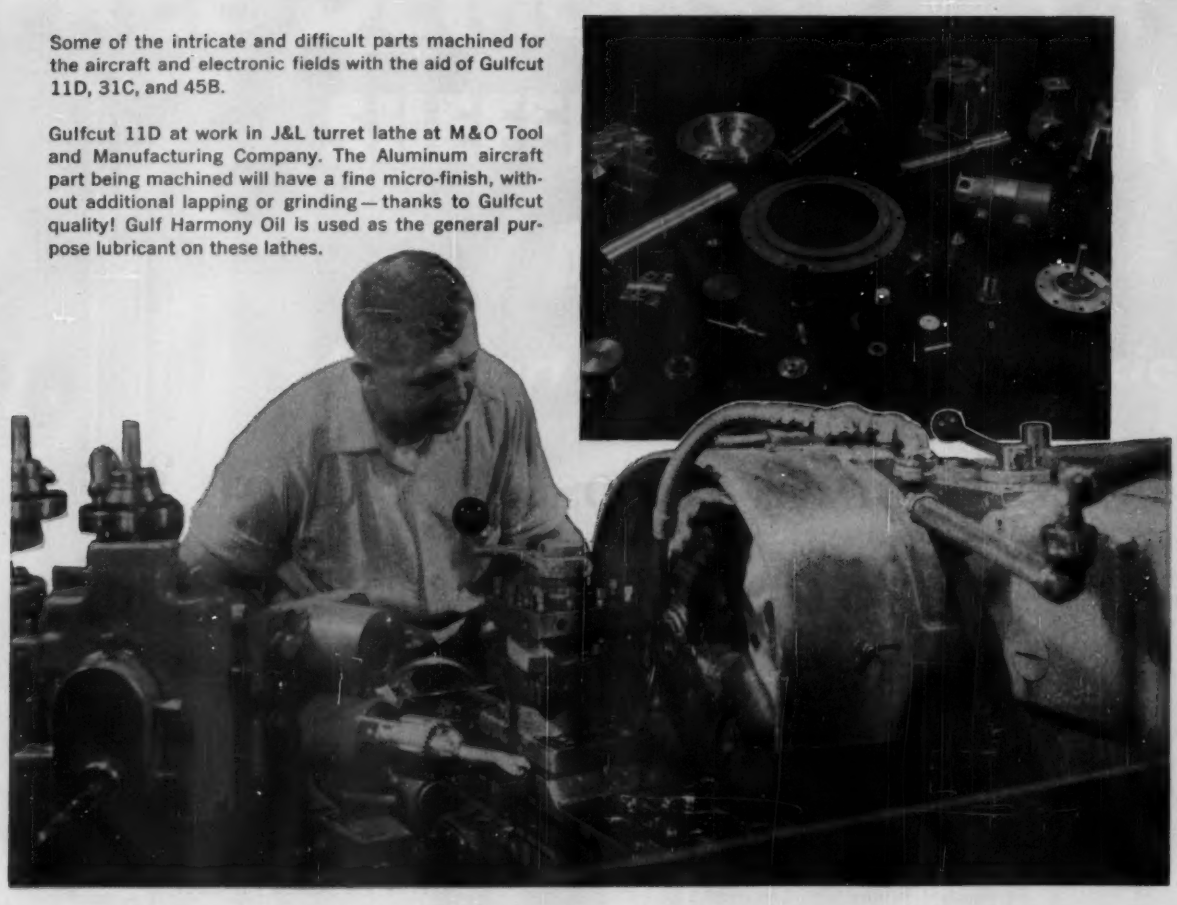
87-19

XLO EX-CELL-O FOR PRECISION

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

Some of the intricate and difficult parts machined for the aircraft and electronic fields with the aid of Gulfcut 11D, 31C, and 45B.

Gulfcut 11D at work in J&L turret lathe at M&O Tool and Manufacturing Company. The Aluminum aircraft part being machined will have a fine micro-finish, without additional lapping or grinding—thanks to Gulfcut quality! Gulf Harmony Oil is used as the general purpose lubricant on these lathes.



"We like the tough machining jobs ...and do them with GULFCUT"

says M&O Tool and Manufacturing Company, Wallingford, Connecticut

"We like the intricate, difficult jobs," says Mr. William E. Maseychik, owner. And Gulfcut helps us turn them out . . . on schedule. On our type of precision work, cutting oils must have more than just excellent cooling properties. They must have outstanding anti-weld characteristics, and extreme load-carrying ability. We've used Gulfcut Oils since the day we opened, because Gulfcut does everything we require."

M&O Tool and Manufacturing Company gets increased tool life by using Gulfcut . . . and less built-up edge. Gulfcut helps them maintain fine finishes to tolerances of five ten-thousandths. "We hold such tolerances consistently on our Jones & Lamson turret lathes," says Mr. Maseychik, "on aluminum, titanium, monel, inconel, SAE steels, many grades of stainless. Gulfcut certainly plays a major part in the quality of our machining!"

Why not investigate the benefits of Gulfcut cutting oils in your shop? Just call your Gulf Sales Engineer. He's at your nearest Gulf office, ready to serve *you!*

GULF OIL CORPORATION
1822 Gulf Building
Pittsburgh 30, Pa.

GULF

THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS

Maximum Automation Potential

PREDICTS BEFORE CAPITAL INVESTMENT

Metal removal costs too high?

Carborundum's new M-A-P Method gives you a chance to compare the advantages of coated abrasives

Maximum Automation Potential is a metal removal prediction method—predicts cost savings and production increases with the use of abrasive belts on your present or planned production operations. M-A-P is a *new* engineering service provided by The Carborundum Company. Now you can *compare* the advantages of using abrasive belts on either heavy metal removal or on the finishing or semi-finishing operations of any component part you manufacture.

M-A-P metal removal recommendations are made for you by Carborundum's coated abrasives engineers at the Carborundum plant. A study is made of your specific operation based on a few simple production facts which you provide and an M-A-P recommendation *is mailed to you* without cost or obligation—gives you the opportunity to *know* what savings can be expected *before* making a material or equipment change.

M-A-P predictions are based on facts accumulated through Carborundum's many years of abrasive experience and the abrasive machinery know-how of its Curtis Machine Division. These abrasive facts have been developed into M-A-P formulas—new positive standards for every factor which enters into grinding metal with abrasive belts.

To determine *your* Maximum Automation Potential with abrasive belts write for the M-A-P Brochure which explains this new service to industry in detail. Address inquiries to: Dept. 47 M-A-P, Senior Coated Abrasives Engineer—

The **CARBORUNDUM** Company

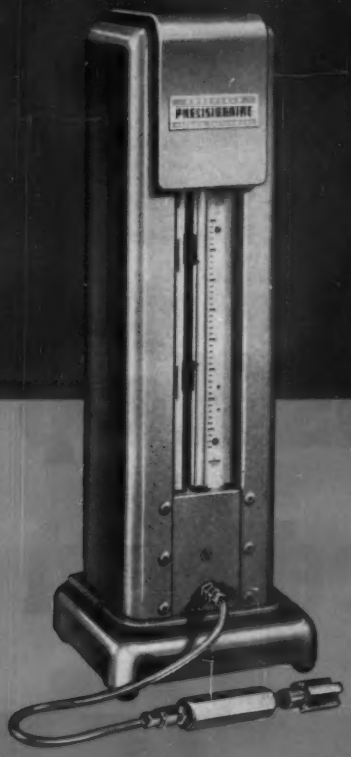
COATED ABRASIVES DIVISION

Niagara Falls, New York

FREE DEMONSTRATION

SHEFFIELD Adjustable AIR GAGES

for Short Runs and Emergencies



SUCH AS:

- Aircraft manufacturers, subcontractors and job shops having limited production.
- Accidental damage to a vitally needed single purpose gage.
- An unexpected engineering change involving part size.
- A short run of special parts for which no gages have been provided.
- A mistake or failure in ordering the needed single purpose gages.
- Sudden need for process gages at the production machines.

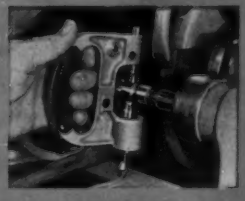
Don't let any of these situations cause costly scrap, delays or embarrassing confusion in inspection, in the shop or in the toolroom. A small investment in the adjustable air gages here illustrated is your best insurance against unpredictable production losses. *The Sheffield Corporation, Div. 1, Dayton 1, Ohio, U.S.A.*

ADJUSTABLE BALLJET SPINDLE KITS
1" to 3"

In 5 minutes you can assemble, for precision gaging, a spindle for ANY SIZE hole from 1" to 3". No auxiliary equipment needed except conventional gage blocks—NOT EVEN ONE MASTER SETTING RING.

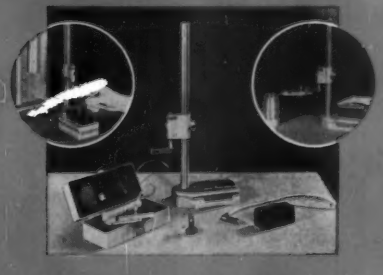
ADJUSTABLE AIREBORE GAGE KITS
3" to 12"

The Airebore Gage can be set precisely to any diameter from 3" to 12" by means of a calibrator and gage blocks. No master rings are needed.



PLUNJET ADJUSTABLE SNAP GAGES
0" to 12"

Twelve Plunjet Adjustable Snap Gages cover a gaging range from 0" to 12"—Larger sizes on special order.

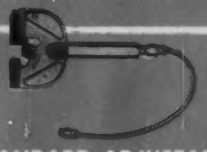


AIRETEST AND PLUNJET STAND

This stand accommodates an Airetest Indicator—also converts to a comparator or height gage by using a Plunjet or dial indicator and anvil.

SELF-CENTERING ADJUSTABLE SPINDLES
$\frac{9}{32}$" to 3"

Four Self-centering Adjustable Spindles cover respectively the ranges of $\frac{9}{32}$" to $\frac{7}{16}$", $\frac{7}{16}$" to $\frac{7}{8}$", $\frac{7}{8}$" to 1½" and 1½" to 3". All but the smallest can be set with gage blocks.



STANDARD ADJUSTABLE AIRSNAPS
¼" to 5½"

Available in 17 models to cover the range .2500" to 5.500". Up to 3.000" the anvil has an adjustment of ¼"—above that, ½".

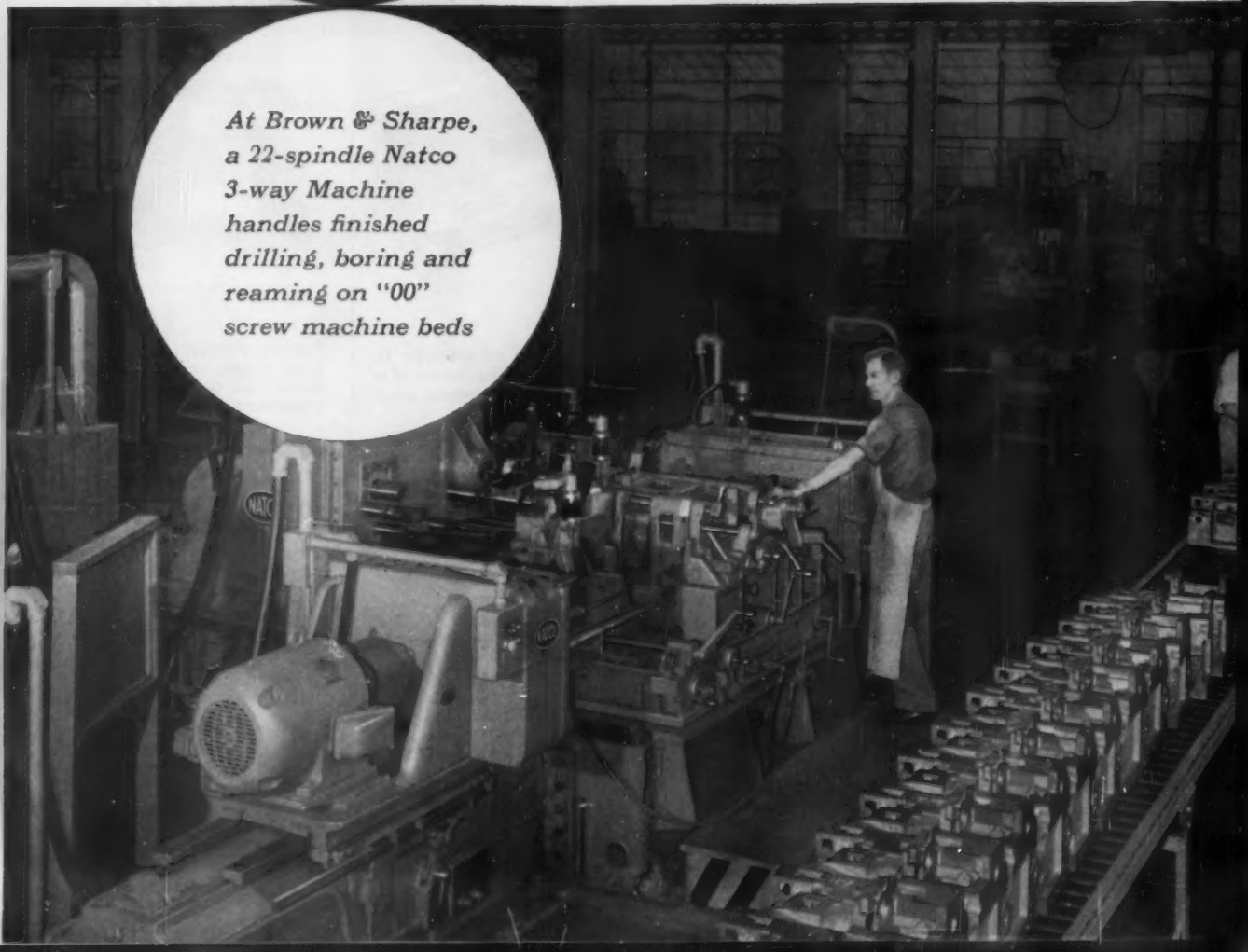
the **SHEFFIELD** *corporation*

manufacture and measurement for mankind

Call Your Sheffield Representative for a Demonstration in Your Plant

At Brown & Sharpe

Natcos Help From



At Brown & Sharpe, a 22-spindle Natco 3-way Machine handles finished drilling, boring and reaming on "00" screw machine beds

Call Your Sheffield Representative for a Demonstration in Your Plant

NATCO

Slash In-Process Time 16 Weeks to One Week

On Automatic Screw Machine Beds

Even on precise machine tool parts, traditionally handled on a "job-shop" basis, Brown & Sharpe gained great advantage by installing an automatic line. Prominent in the line are two Natcos, engineered and tooled to handle all drilling, boring and reaming on either the No. 00 or No. 2 automatic screw machine beds.

One Natco does all roughing—the second handles finishing. Total of 62 operations. Each Natco is tooled to process two parts at once—tooling is interchangeable to accommodate either sized bed.

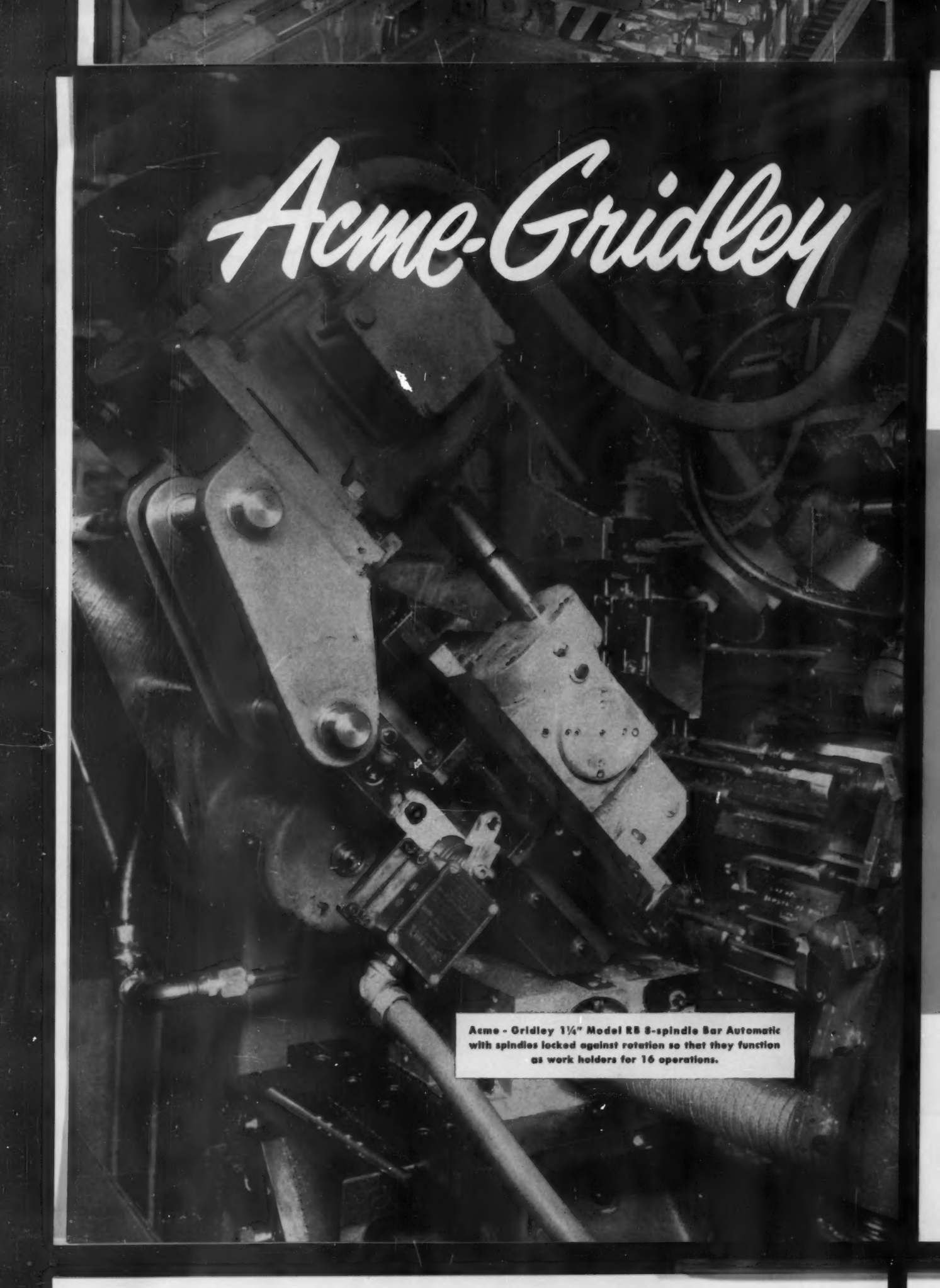
Extreme machine tool accuracy must be maintained throughout. In one operation the Natco drills through five walls, holding centers parallel to the locating surface within .0015" for the full 42" distance. In another case, Natco engineering devised a tooling leaf that automatically drops through a core in the part, providing internal boring bar support.

Natcos make sense even on "job-shop" jobs. Call in a Natco Field Engineer—he can quickly tell you whether a Natco can be a cost-saver on your next job.

National Automatic Tool Company, Inc.

Richmond, Indiana *Multi-spindle drilling, boring, and tapping machines. Special machines for automatic production.*

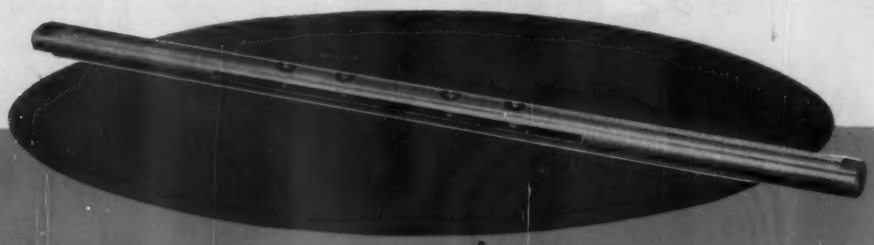
Call Natco Offices in Chicago, Detroit, New York, Buffalo, Boston, Philadelphia, Cleveland, Los Angeles; distributors in other cities.



Acme - Gridley 1¼" Model RB 8-spindle Bar Automatic with spindles locked against rotation so that they function as work holders for 16 operations.

basic design + proper tooling

. . . reduces machine investment 75%
. . . reduces cost-per-piece 90%



This customer wanted to determine the quickest and most economical way to make double-barrel carburetor shafts. NAMCO engineers recommended a procedure that resulted in his producing these shafts at one-tenth the previous unit cost and on a machine that required but one-fourth the equipment investment needed to accomplish the job by in-line manufacturing methods.

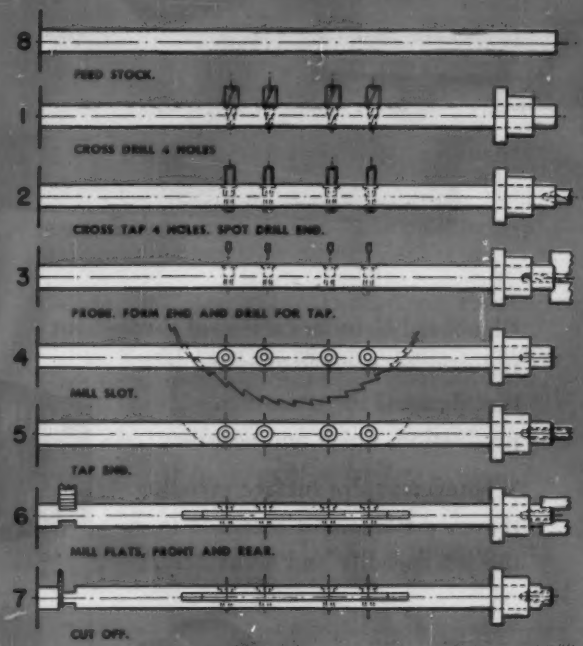
Selected to do the job was a standard 1¼" RB 8-spindle Acme-Gridley bar automatic. Each of its eight spindles was locked against rotation so that it functioned as a work holder as the machine indexed the work from position to position. Because accurate indexing is one of the inherent features of Acme-Gridley basic design, it assured proper alignment of the work with the standard and special attachments on the end and side toolslides. This permitted holding the close tolerances required on the part while performing the 16 operations indicated on the tooling diagram shown at the right.

* * *

WRITE FOR YOUR FREE COPY OF TP-44. It shows how maximum production versatility and cost reduction can be realized in your manufacturing operations.

JOB FACTS

PART.....Carburetor Shaft MACHINE TIME....6.7 Seconds
MATERIAL.....Brass GROSS PRODUCTION 533 per hr.
NUMBER OF OPERATIONS.....16



why don't you

INDEX . . . to lower machining costs . . .

with *Acme-Gridley*

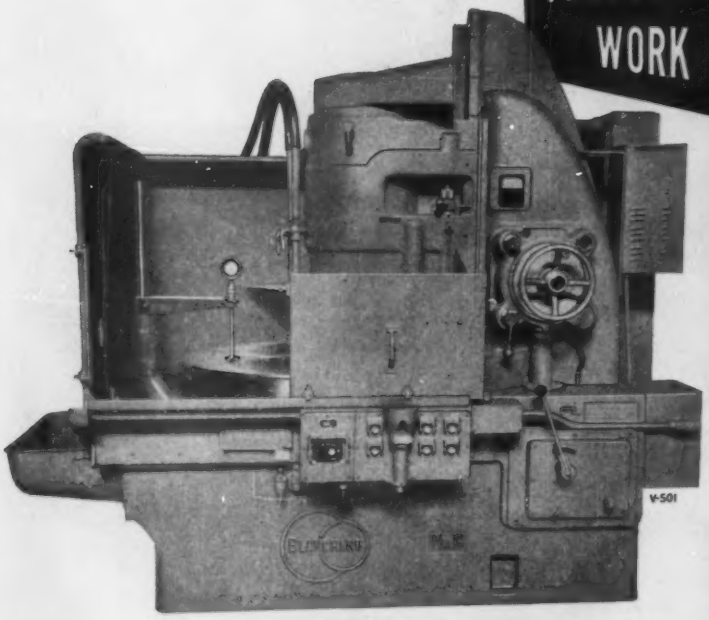
CONTROLLED CYCLE

National Acme

THE NATIONAL ACME CO.
171 EAST 131ST STREET
CLEVELAND 8, OHIO

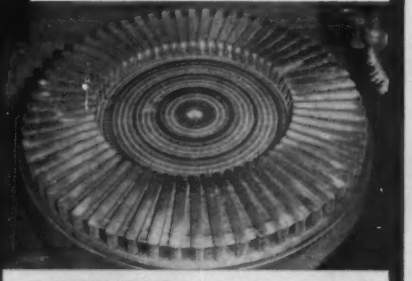
Sales Offices . . . Newark, N. J. . . . Detroit, Mich. . . . Chicago, Ill.

for BEST results in surface grinding...
PUT IT ON THE BLANCHARD



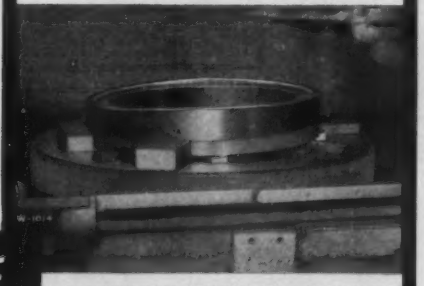
PRODUCTION WORK

SIDE PLATES. 9" x 18" plates ground from rough on No. 18 Blanchard with 36" chuck. Stock removal 1/16" to 1/8" per side. Held flat within .003", parallel to .001", and to dimension tolerance of ±.001". Production: 30 surfaces per hour.



CONNECTING LEVERS. Cast iron levers ground in special magnetic fixture with pins located in "vee's". Stock removal per side is 1/32" to 1/16"; must be flat and at right angles to pins. No. 18 production: 180 pieces per hour, compared to 20 pieces per hour by former method used.

MAINTENANCE AND ODD LOT WORK



HARDENED STEEL PUNCHES. This 24-13/16" dia. punch, reground on a No. 18, is centered radially on 36" magnetic chuck. Duplicate circumferential and radial shear reliefs are generated with two setups.

GRANITE SURFACE PLATES. A No. 18 Blanchard reconditions this 18" x 34" granite surface plate by grinding it flat within .0002". 3/16" of stock is removed in 5 hours.

Blanchard Grinders are used throughout industry on surface grinding jobs that demand the utmost in production, finish and accuracy.

Whatever *you're* surface grinding, there's a Blanchard designed to do the job speedily and accurately.

PUT IT ON THE BLANCHARD

Send for free copies of "Work done on the Blanchard", fifth edition, and "The Art of Blanchard Surface Grinding".

THE BLANCHARD MACHINE COMPANY
64 STATE ST., CAMBRIDGE 39, MASS., U. S. A.

ROCKWELL-BUILT

DELTA drill presses

Delta 17" Drill Press
Delta 20" Multiple Spindle Drill Press
Delta 14" Utility Drill Press
Delta 15" Drill Press
Delta 14" Super-Hi Sensitive Drill Press

...improve production and cut costs

There are three basic reasons why Delta Drill Presses improve production and cut costs: They're VERSATILE—do the work of many expensive, single-purpose machines. They're FLEXIBLE—can be used singly or in combination—readily adapted to automated operations. They're PORTABLE—easily moved to the work to reduce materials handling, eliminate bottlenecks.

BETTER ENGINEERING—Delta—power tool pioneer—gives you quality tools built to turn out quality work. They're precision engineered for greater accuracy—hold extremely close tolerances, reduce costly rejects—even inexperienced operators turn out fine work.

RUGGED CONSTRUCTION—You get years of high standard performance under hard, continuous operation with every Delta Drill Press. They're built to last—and built to give you lower maintenance costs.

OVER 160 MODELS—Delta Drill Presses are available with: Standard or Production Table, Key Chuck or Morse Taper Spindle, High or Slow Speed, Standard or Power Feed—and in Floor, Bench or Multiple Spindle Set-Ups.

CHOOSE FROM THE WORLD'S MOST COMPLETE DRILL PRESS LINE—Get all the facts—compare—then make up your *own* mind! Your Delta Dealer is listed under "TOOLS" in the Yellow Pages.

Send coupon for all the facts!

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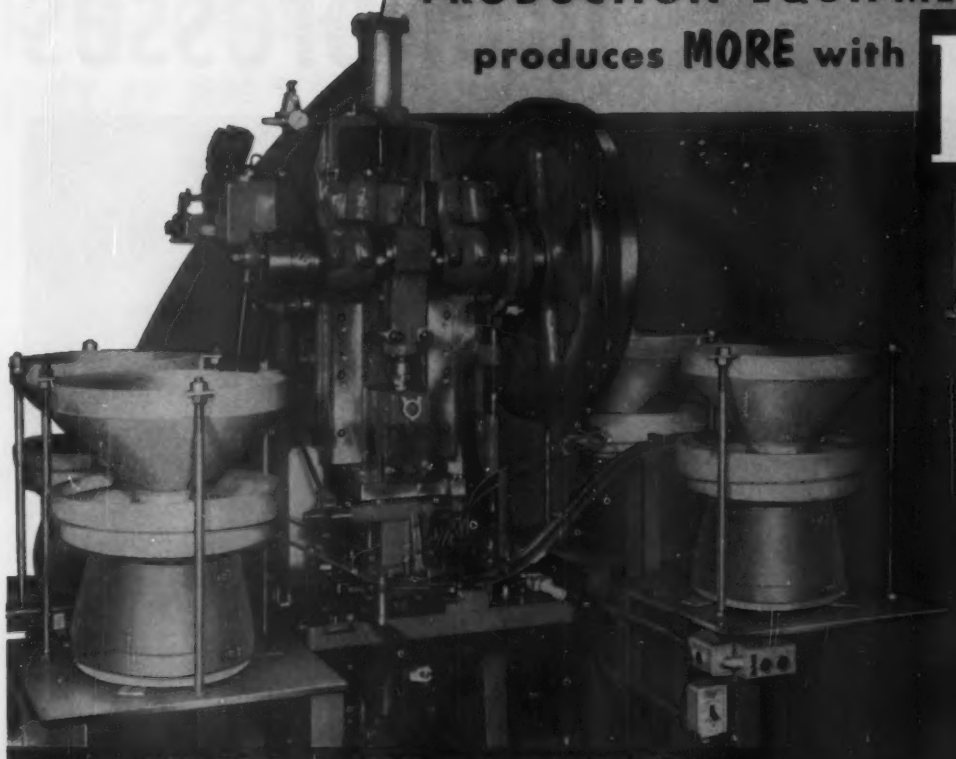
PRODUCTION EQUIPMENT... produces MORE with Peeco

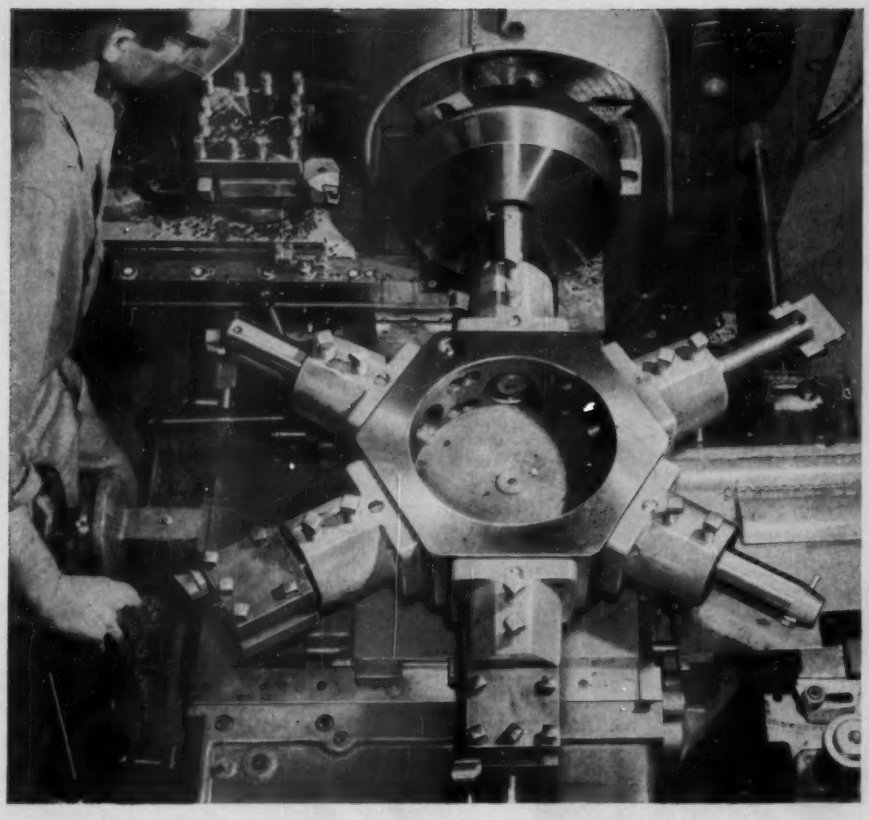


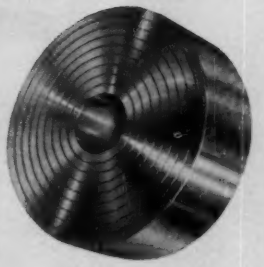
NOW **V & O** PRESS equipment includes

DEVELOPED *PEECO* FEEDERS

Illustration shows the V & O inclinable press with four PEECO vibratory parts feeders and orientation track escapement. This V & O equipment, with ring type dial feed, automatically transfers four finished components for assembly at 70 SPM.

Peec





Expert setup gets more work per chucking

How manufacturer uses C/F turret lathe to produce variety of chuck bodies with only one tool change

To do the job, the manufacturer selected a Gisholt 1L Saddle Type Turret Lathe with a cross-feeding hexagon turret. A 15″ 3-jaw air chuck holds down chucking time. One set of adjustable serrated jaw bases handles the different workpiece sizes for first machining operations. A quick-indexing square turret on the cross slide carries turning, facing and chamfering tools, which work simultaneously with tools on the hexagon turret.

Three stub boring bars on the hex turret bore, counterbore, recess and back face. Because size is set with the cross-feeding turret, these same boring bars are used on different part sizes. Also on the hexagon turret are 2 box-type tool posts for facing, boring or recessing—used for different size workpieces because of the cross-feeding feature. A threading attachment lets the manufacturer thread the hubs, and a taper attachment handles up to 8 inches taper per foot when required.

The sixth tool on the hex turret, a spade cutter, is used for final sizing and is the only special tool changed for each job.

Simple, low-cost tooling combined with the cross-feeding hexagon turret offers maximum efficiency in handling various sizes of similar parts. The rugged Gisholt MASTERLINE Saddle Type Turret Lathes have the speeds, feeds and power to complete the work in the least amount of time. Call your Gisholt Representative today, or write Gisholt for literature.

MASTERLINE GISHOLT SINCE 1887 GISHOLT

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin, U.S.A.

WRITE TODAY for complete set of Gisholt MASTERLINE Saddle Type Turret Lathe Bulletins.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • PACKAGING MACHINES • MOLDED FIBERGLAS PLASTICS

This Cadillac 6" PLA-CHEK GAGE *IS ACCURATE* to .00005"

Cadillac PLA-CHEK

For checking smaller jobs, gages, tools and dies, this portable 6" Cadillac PLA-CHEK Gage is accurate to .00005". It can easily be checked in and out of your tool crib to be used on the surface plate or at the machine. It is completely self-contained and extremely simple in operation. Speeds inspections from minutes to seconds.

Capacity of the 6" PLA-CHEK model can be increased by the addition of a 6" riser without affecting accuracy or sacrificing portability. Send coupon TODAY for complete details!

MAIL THIS COUPON FOR COMPLETE DATA

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P. O. BOX 3806, DETROIT 5, MICHIGAN

Without obligation please rush complete information on the Cadillac PLA-CHEK Gage line to:

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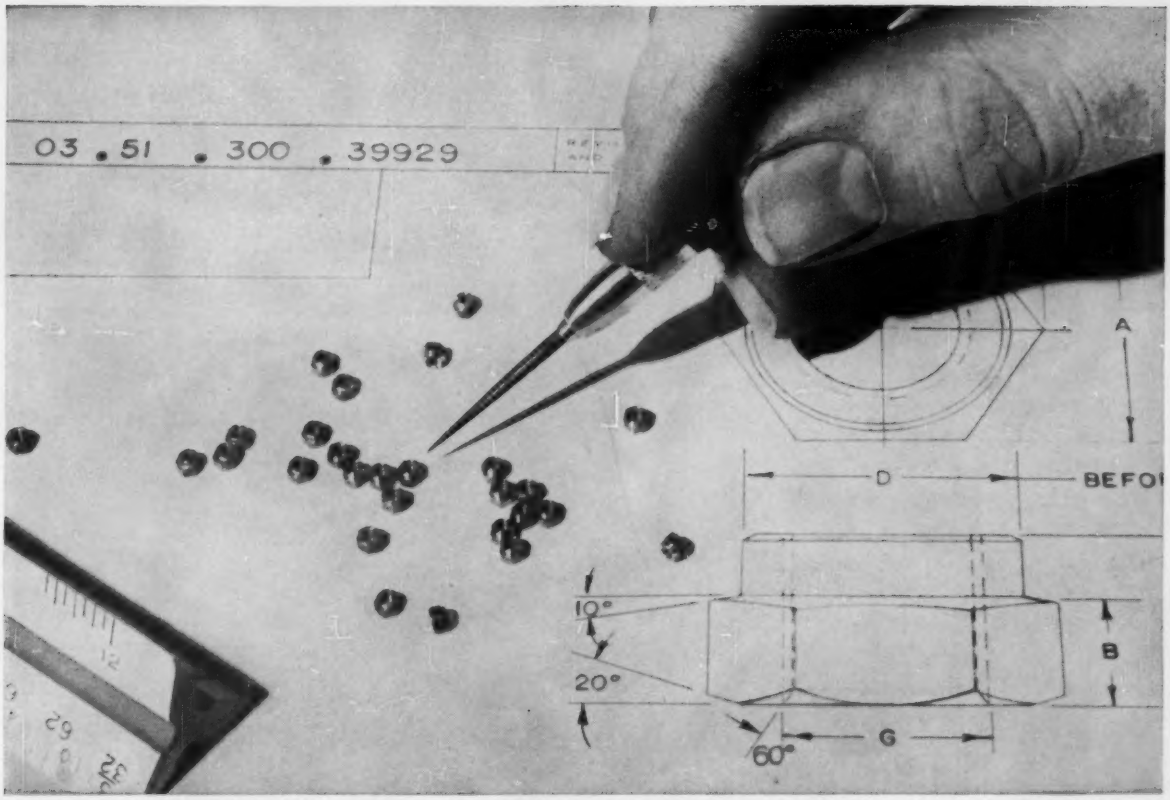
Cadillac
GAGE COMPANY
P. O. BOX 3806 • DETROIT 5, MICH.



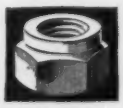
FLEXLOC MICROSIZE locknuts meet designers' needs for tiny precision nuts that retain strength and holding power in the smallest assemblies—servomechanisms, electronic and electrical equipment, all miniature devices.

New FLEXLOC Microsize Locknuts

Now available in Alloy Steel, Stainless Steel, Brass and Aluminum for lighter, more compact designs

SIZE	Across Flats		Hex. Height	Across Corners	Height
	MAX.	MIN.	REF.	MIN.	REF.
0-80 NF-3B	.111	.107	.046	.121	.075
1-64 NC-3B	.127	.123	.056	.140	.090
1-72 NF-3B	.127	.123	.056	.140	.090
2-56 NC-3B	.158	.153	.067	.176	.105
2-64 NF-3B	.158	.153	.067	.176	.105
3-48 NC-3B	.190	.183	.071	.210	.120
3-56 NF-3B	.190	.183	.071	.210	.120
4-40 NC-3B	.190	.183	.071	.210	.120
4-48 NF-3B	.190	.183	.071	.210	.120

SPECIFICATIONS: Available in brass (plain or cadmium plated) and aluminum (plain or chemically treated), for temperatures to 250°F; in alloy steel (plain or cadmium plated) and 18-8 stainless steel (silver plated) for temperatures to 550°F.



New FLEXLOC Microsize locknuts are smaller and lighter than regular FLEXLOCS of the same nominal diameter. Wrenches of smaller size are used to install them. Mating joints or flanges can be designed smaller—with no loss in strength or convenience of assembly.

Microsize FLEXLOCS have all the advantages of larger FLEXLOCS. One-piece, all-metal construction—nothing to put together, come apart, lose or forget. Use them as lock or stop nuts—they stay put anywhere on a threaded member as soon as the locking threads are fully engaged. Uniform locking torques insure accurate preloading. There are no nonmetallic inserts to pop out or deteriorate. Moisture, dryness, oil won't affect these Microsize FLEXLOCS. Just screw them on. They lock and stay locked. Vibration won't shake them loose.

For complete information on Microsize FLEXLOCS, consult your authorized SPS distributor. Or write STANDARD PRESSED STEEL CO., Jenkintown 1, Pa.

STANDARD PRESSED STEEL CO.

FLEXLOC LOCKNUT DIVISION SPS

JENKINTOWN PENNSYLVANIA

GENERAL ELECTRIC ANNOUNCES...
NEW Industrial
GENERAL ELECTRIC
DIRECT CURRENT MOTOR

Direct-current Motor

KINAMATIC* a new standard in direct-current motors, gives your machines wider speed ranges, greater output

To meet modern industrial needs for faster, more automatic, more continuous production, General Electric has designed an entirely new direct-current motor—the d-c Kinamatic.

Designed for Automation—Now, a direct-current motor has been designed for the modern job it has to do—either as individual motor drive or in regulating systems. The new General Electric d-c Kinamatic motor supplies the wide speed range and versatility required for today's manufacturing methods. It is designed for the close control of machines and split-second timing of processes essential to higher output.

Accelerated Production—The new d-c Kinamatic motor will modernize your equipment, give it increased power, higher speeds, greater output capacity. With the quick-acting G-E Kinamatic motor, your machines will process a greater variety of products . . . faster . . . easier . . . and with less maintenance and spoilage.

More Powerful—By combining advanced design with improved materials and manufacturing techniques, General Electric engineers have packed more power into the entire Kinamatic line. The powerful Kinamatic motor, with new stamina and durability, is ready to become one of your most effective weapons for keeping costs down, for meeting competition, for boosting productivity levels.

Engineering Help—Industrial specialists in 149 conveniently located General Electric Apparatus Sales Offices have the complete story on how the new d-c Kinamatic motors and generators can benefit your operation. For full details, contact your G-E Sales Representative, or write for Bulletin GEA-6355. *Direct Current Motor and Generator Department, General Electric Company, Erie, Pennsylvania.* 813-1

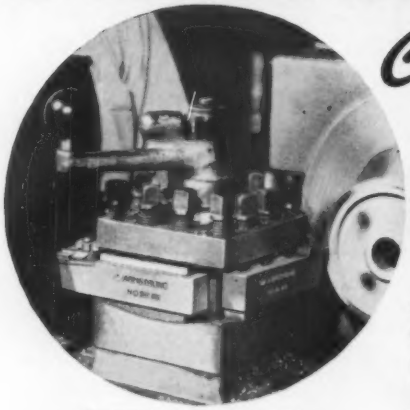
* Trade Mark of the General Electric Company

Progress Is Our Most Important Product

GENERAL ELECTRIC

ARMSTRONG

Carbide Insert TOOL HOLDERS



for use in clamp type rests

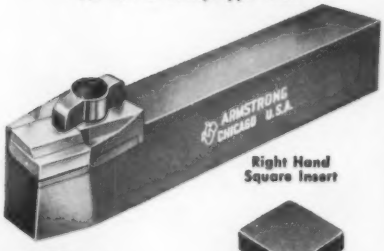
for use in conventional tool holders

The ARMSTRONG System of Tool Holders gives the advantages of (NO GRINDING) "throw-away" insert tooling for all metal turning—for tool room, machine shop and maintenance lathes as well as for production machine tools. Included in the Armstrong System are ARMSTRONG Carbide Insert Tool Holders with shanks to fit in conventional tool posts and for clamp rests of all sorts. Both types are provided in a wide range of sizes to hold either "square" or "triangular" carbide inserts. Both types come in right-hand or left-hand styles. For Carbide Insert Tool Holders exactly suited for a specific need or piece of equipment, standardize on ARMSTRONG Tools.

Special ARMSTRONG design features include: (1) Fast convenient clamping which permits rapid indexing of inserts, (2) replaceable hardened tool steel seat ground to provide a flat base for inserts, (3) accurately machined heat treated alloy steel shanks for extra strength and rigidity.

Because ARMSTRONG Armide Inserts as well as ARMSTRONG Carbide Insert TOOL HOLDERS are carried in stock by leading Industrial Distributors they are as available as your telephone—single tool sets or a selection of sizes.

Write for catalog sheets.



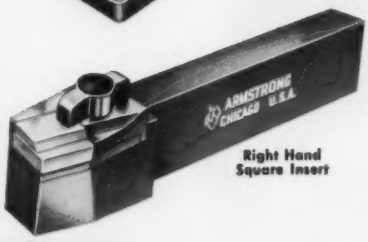
Right Hand Square Insert

Left Hand Square Insert

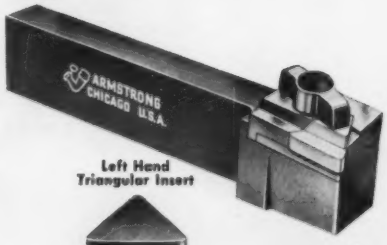
Right Hand Triangular Insert

Left Hand Triangular Insert

Left Hand Square Insert



Right Hand Square Insert



Left Hand Triangular Insert

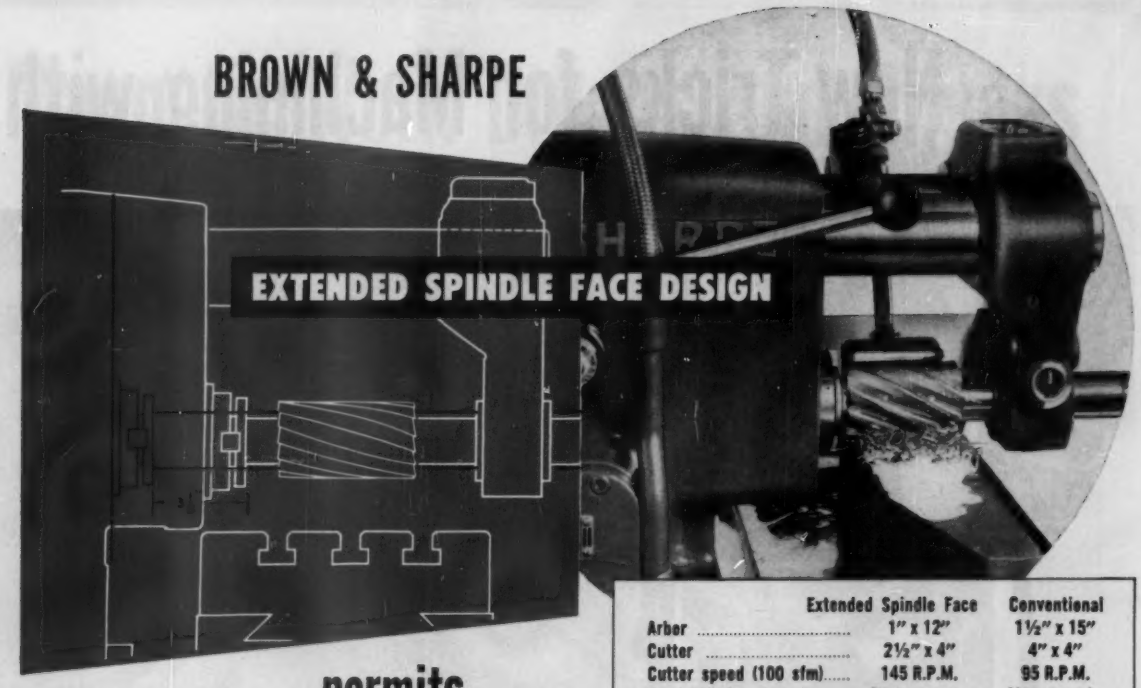
Right Hand Triangular Insert

Buy ARMSTRONG TOOLS from your Industrial Distributor

ARMSTRONG BROS. TOOL CO.

5215 W. ARMSTRONG AVE. • CHICAGO 30, ILL.

BROWN & SHARPE



	Extended Spindle Face	Conventional
Arbor	1" x 12"	1½" x 15"
Cutter	2½" x 4"	4" x 4"
Cutter speed (100 sfm)	145 R.P.M.	95 R.P.M.
Feed (.047" per rev.)	6¾" per min.	4½" per min.

permits

30% SAVING

in cutting tool expense

A simple feature at first glance, the extended spindle face of Brown & Sharpe Universal and Plain Milling Machines is the source of multiple savings in milling costs. As the diagram shows, this exclusive design brings the spindle nose support over 3" closer to the cutting point, providing greatly increased rigidity and resistance to vibration.

PLUS – 50% FASTER PRODUCTION

In the set-up illustrated, the use of smaller diameter cutters permitted an increase in RPM at the given surface speed. Feed rate was increased proportionately, providing 50% faster production with the same surface quality. The extended spindle face is one of many examples of economy-minded design found only in Brown & Sharpe Milling Machines. Get full information . . . compare. You'll find there is no better investment — by any test. Write: Brown & Sharpe Mfg. Co., Providence 1, Rhode Island.

Brown & Sharpe

MILLING, GRINDING, AND SCREW MACHINES, CUTTERS, MACHINE TOOL ACCESSORIES, PRECISION TOOLS, PUMPS

You save with . . .

SMALLER DIAMETER ARBORS

Because of shorter span between supports, a shorter, smaller diameter arbor can be used, with deflection resistance equal to that of 50% larger diameter arbor on conventional machine.

REDUCES ARBOR COSTS

SMALLER DIAMETER CUTTERS

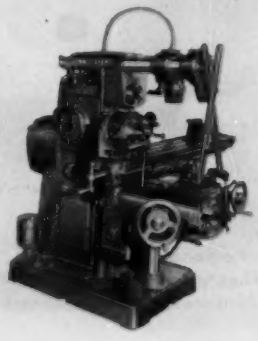
Because of reduced arbor diameter, in the example illustrated a 2½" x 4" cutter with 1" hole replaces the 4" x 4" cutter with 1½" hole required on a conventional machine.

REDUCES CUTTER INVESTMENT

EXTENDED CUTTER LIFE

Extra support and increased rigidity minimizes vibration. Cutters run longer before resharpening. Downtime is reduced.

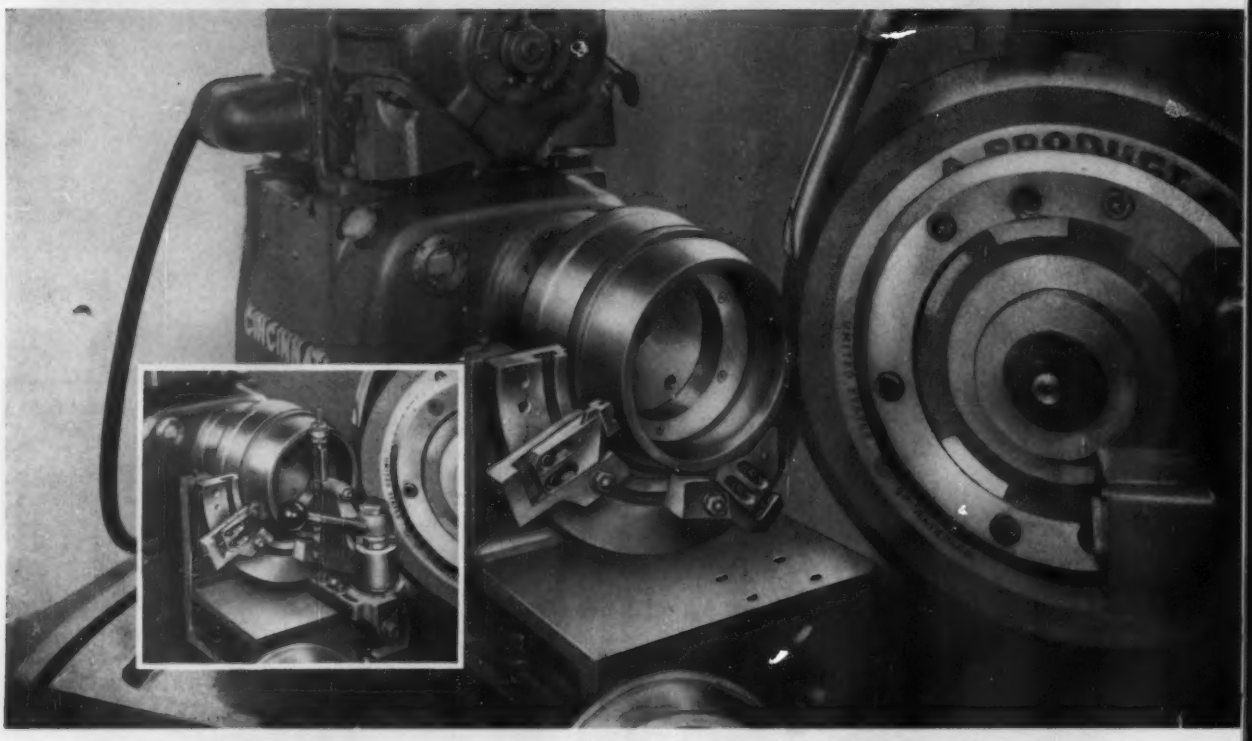
SAVES MAINTENANCE COSTS



No. 2 UNIVERSAL Milling Machines 3 and 5 HP Spindle Drive

No. 2 PLAIN Milling Machines 3 and 5 HP Spindle Drive

New Tricks for Machining with



Taft-Peirce Magnetic Work Drivers

Two-pole Taft-Peirce Permanent Magnet Work Driver. Magnetically holds ball bearing inner races during grinding of external ball grooves. Parts are shown in front of work driver.

This Latest Application of Magnetic Forces by Taft-Peirce provides a Real Tooling Setup at great savings!

Here's a complete tooling setup for minimum cost! Magnetic Work Drivers eliminate awkward tailstock arrangement, cost substantially less than complicated holding devices. Little or no maintenance is required, there's nothing to go wrong. Developed primarily for shoe type centerless grinding of ball bearing, inner and outer races, the T-P Work Driver can hold a variety of sizes and shapes, including tapered OD for governing valve plugs and OD and ID of valve ports. Work Drivers can be designed to handle work from ½" ID and larger. Furnished in either permanent magnet or in electromagnetic models, Work Drivers are specially designed and built for each application.

The Taft-Peirce Family

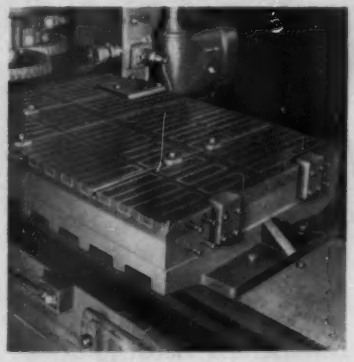
AIR GAGES • LAPPING MACHINES • PRECISION GAGES
TOOL-ROOM SPECIALTIES • MAGNETIC CHUCKS • GRINDING MACHI

Magnetic Work Drivers and Chucks

Superpower Rotary Electromagnetic Chucks

Taft-Peirce packs maximum holding power in a small space so that simplified, low-cost setups can be used on rotating spindles. This small Rotary Chuck is grinding close to a shoulder, without complicated fixtures. There are ten standard sizes with diameters from 5⅛″ to 30½″, to give the most effective holding power for the work being done. Special faceplates can also be designed.

Superpower Specials Do Wide Variety of Work

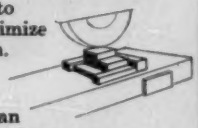


The speed and simplicity of magnetic chuck-held machining is providing lower-cost production on an ever greater range of work. The special 55½″ x 40″ Superpower Chuck at right was built to hold cast iron loom-sides on a 75 hp milling machine. Three 18″ carbide cutters and two 4″ mills take ¼″ cuts simultaneously at 30″ per minute. Taft-Peirce Chucks have been built to handle light planing and milling and special shapes, including holding propeller blades for shaping and contour grinding. If there is any possibility magnetic chucks can help your production, give the problem to Taft-Peirce for further study.

Tips

and IDEAS on MAGNETIC CHUCKING

Permanent Magnetic Chucks should always be faced with the pack (handle) moved to the "off" position. This assures minimum deflection of the faceplate. Electromagnetic Chucks should be turned "on" and allowed to "warm-up" to minimize faceplate distortion.



Magnetic chucks can be used to hold non-ferrous materials by "backing-up" or surrounding the workpiece with bars or pieces of steel.

Irregular shaped parts can be easily ground using the "mold" technique. Invert part, surround with a mold of lead, babbit or sulphur incorporating steel slugs near the top of the mold. Then, turn right side up, place on chuck and grind.

Get the Taft-Peirce Catalog on Chucks

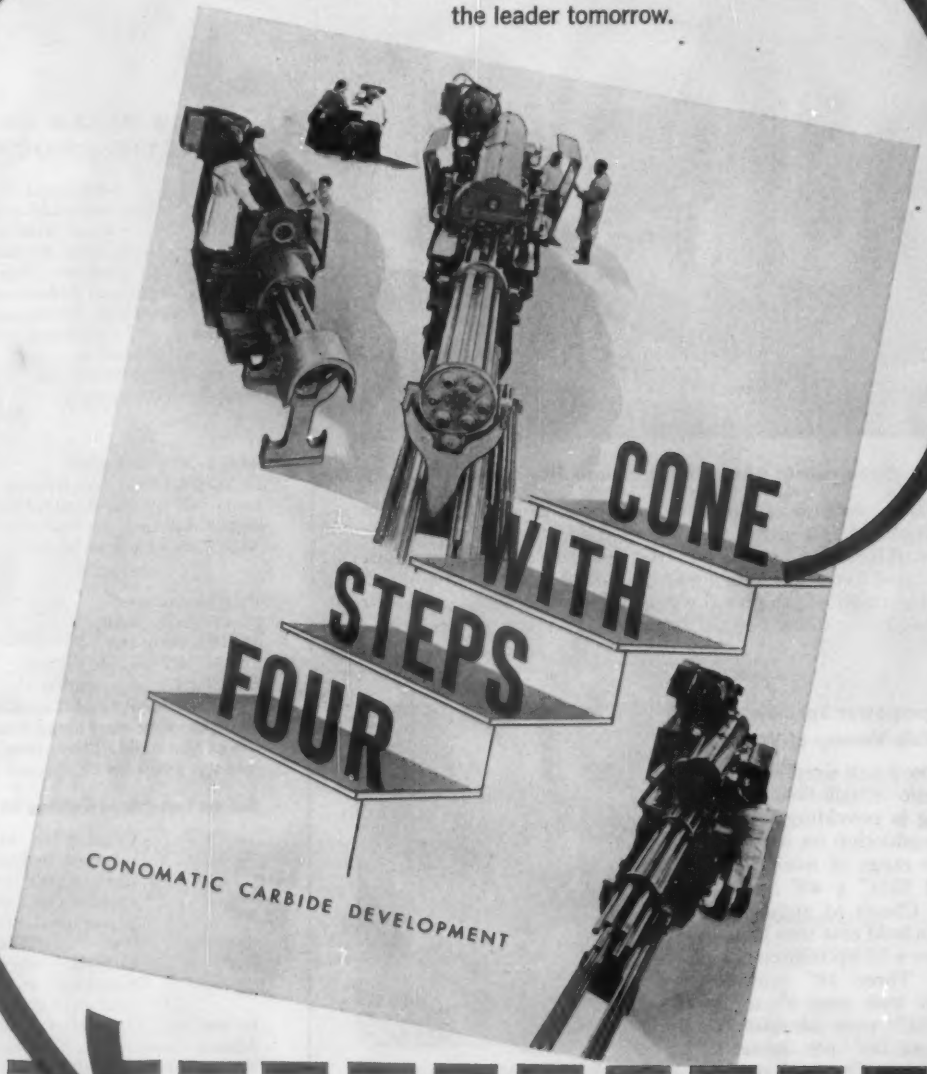
Catalog No. 412 presents technical data, design details, suggestions and prices on the complete Taft-Peirce line. Find out what magnetic chucking can do for *your* production by writing: The Taft-Peirce Manufacturing Co., Woonsocket, Rhode Island.

TAKE IT TO TAFT-PEIRCE

THE TAFT-PEIRCE MANUFACTURING CO.
WOONSOCKET, R. I.

T-P Means TOP Precision

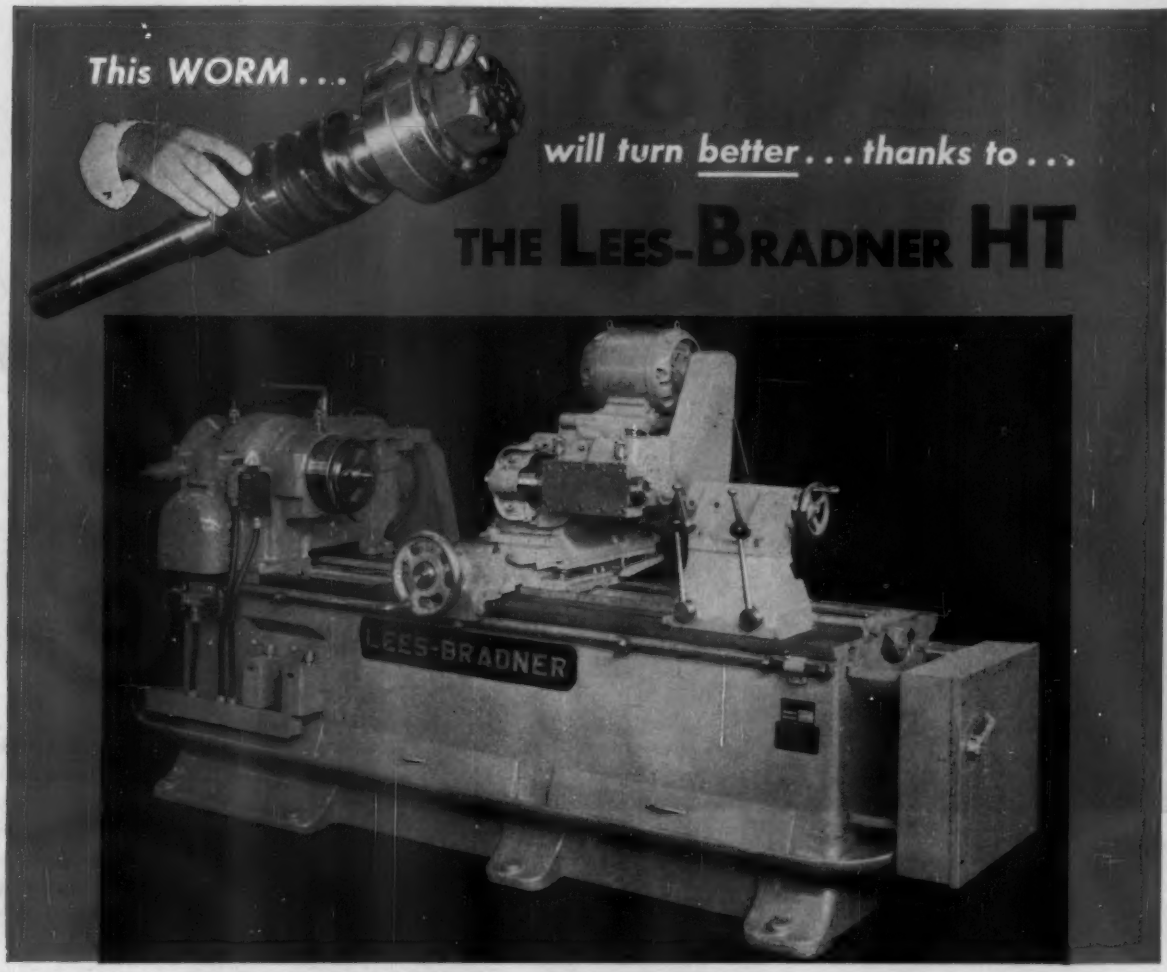
If you haven't read this important booklet, your production line may be operating at less than peak efficiency. Your operations may be beating competition with HSS today, but you will likely need carbide tooling to be the leader tomorrow.



Write for your free copy of this important booklet today!

Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U.S.A.



Building precision into other machine tools is the unique distinction that can be claimed for The Lees-Bradner Model HT Thread Milling Machine.

The worm illustrated above was produced on this machine by the Cleveland Worm and Gear Co. in one hour 23 minutes at a cutter spindle speed of 61 R. P. M. The pitch diameter of the worm was 3.728″ with an outside diameter of 4.625″.

Many tough thread milling problems like this have been, and are being, solved by this remarkably versatile machine.

Contact us or your local Lees-Bradner representative for complete information on fast, precision threading with the Model HT Universal Thread Milling Machine.

Details on Worm Gear Production

Hob Spindle Speed	61 R. P. M.
Circular Pitch	1.420″
Pitch Diameter	3.728″
Outside Diameter	4.625″
Threading Time	1 hour 23 min.
Material	2315 Steel
Weight of Worm	51.76 lbs.

the LEES-BRADNER Company

CLEVELAND 11, OHIO, U.S.A.

you can save valuable

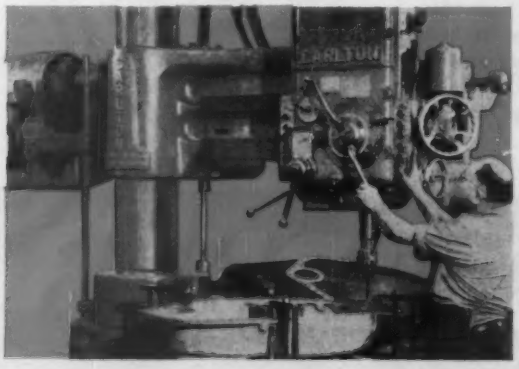
one operation ahead . . . with

Carlton

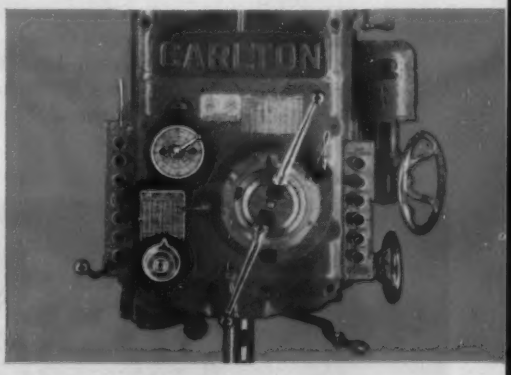
The new Carlton-Leber speed-feed pre-selector system speeds up drilling by permitting operator to set speed and feed for the next operation while the machine is still under cut. With this productive new device, the time lost heretofore in setting speeds and feeds is now used for almost continuous drilling. Now you stop the spindle only for changing cutting tools.

Pre-selector Here's how it works: while the machine is cutting on one operation, the operator sets speed and feed dials for the next operation. When present operation is complete, he stops the

take your choice of 4 different speed-feed controls



1 ***Manual*** 2 shifter levers for controlling speeds, 2 for controlling feeds.



2 ***Partial pre-selector*** 1 dial and 1 lever selects 36 spindle speeds. Feeds selected manually

drilling time by giving operator a chance to set

the ingenious

pre-selector

spindle, changes the drill, and starts spindle again. At that instant, the gears automatically shift to the correct speed and feed.

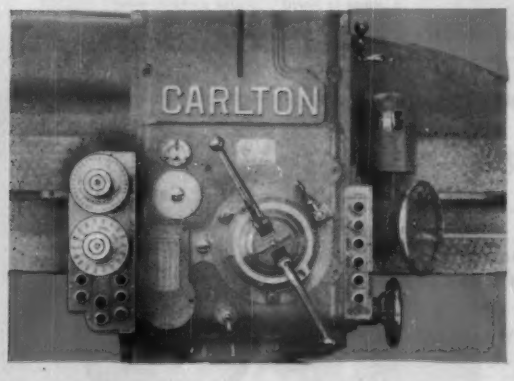
Additional time is saved by instantaneous gear shifting made possible by mechanically oscillating the change gears which assures quiet gear mesh.

Partial Pre-selector Pre-selects four different speed ranges and neutral. Nine speeds are selected manually in each range. Reduces by half the time required to shift over the manual method.

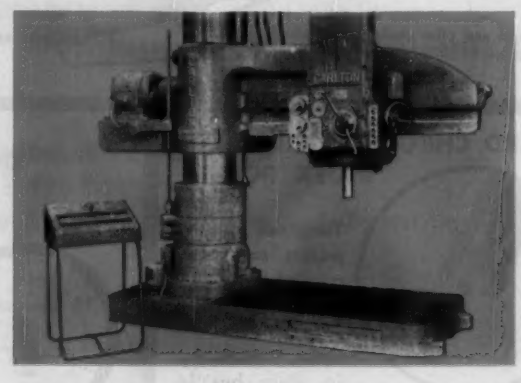
Programming Another Carlton-Leber system—the programming unit—can be used in connection with the pre-selector. The programming system pre-selects speeds and feeds for an entire drilling program including as many as 20 or 30 operations. Manual gear shift also available.

See the pre-selector and programmer in operation. Ask your Carlton distributor to arrange a showing of the new Carlton movie. Or, write us for descriptive free bulletin. The Carlton Machine Tool Co., Cincinnati 25, Ohio, U.S.A.

offered only by Carlton, specialists in radial drills



3 ***Pre-selector*** 2 graduated dials (one each for speeds and feeds) pre-set speeds and feeds.



4 ***Programming*** Sets up correct speeds and feeds for a complete sequence of operations.

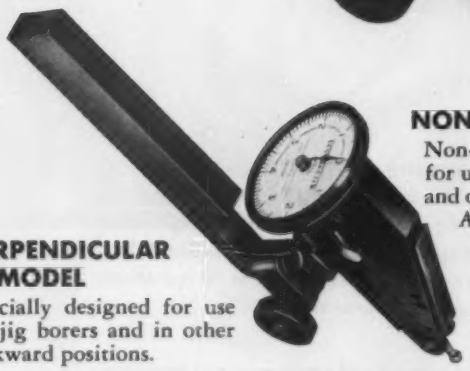
Looks Can Deceive...

Many have tried . . . yet

3 TYPES

REGULAR MODEL

Shown actual size. Adaptable to all tool posts, height and surface gages without need for cumbersome, error-producing attachments.



PERPENDICULAR MODEL

Specially designed for use on jig borers and in other awkward positions.

NON-MAGNETIC MODEL

Non-magnetic construction for use on magnetic chucks, and other magnetic fixtures. Attractively finished in natural brass.

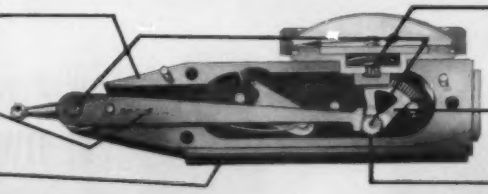
WHY the Testmaster is so Amazingly accurate

Its Movement is designed and built by the world's foremost gage specialists

Rigid case construction maintains proper alignment of Movement.

Rigid steel lever provides faithful transfer of point motion.

Precisely machined dovetail slides at bottom and end offer choice of attachment location.



Jeweled bearings throughout assure low friction operation and maximum sensitivity.

Accurate crown gear provides simple, direct, low friction transfer of lever movement to hand . . . *and uniform wear.*

Gears are precision hobbed for maximum Accuracy.

HARD CHROMED, PRECISION INDEX POINTS

Tungsten tipped points are also available for extra durability.

Index Point locks in place but is easily removed for replacement. 180° swivel of Point permits wide choice of instrument positioning.

ONLY 2 DIALS TAKE CARE OF ALL ENGLISH MEASUREMENTS

Don't fill up your tool crib and pay for a lot of confusing dials.

Dials graduated .001" or .0001". (Metric, .0025 mm or .010mm). Easily adjustable for zero setting in any position.

Performance Will Tell You!

***none* match the built-in accuracy of the**

FEDERAL TESTMASTER

TRADEMARK REG. U.S. PAT. OFF.

***Many universal test indicators are "look-alikes".* Each year it seems somebody else decides to copy the Federal Testmaster. But however closely its *appearance* is imitated, you can always tell the Testmaster by the accuracy of its performance . . . and that's what counts!**

No other gage has a Movement like the Testmaster. Actuated by a lever and crown gear, and with jeweled bearings throughout, the Testmaster has exceptional sensitivity and *long, repetitive* accuracy throughout its range. Its time-proven Movement is not to be confused with "spiral groove" gages whose accuracy is uncertain due to inherent friction and irregular wear. Nor should it be confused with other Movements where friction, looseness of fits, end shake in pivots, and uneven contact pressure contribute to unreliable performance.

The Testmaster is designed by the world's largest gage manufacturer and is ruggedly constructed to give lasting service in shop or toolroom where small size and versatility are often so important in an instrument.

The Testmaster is simple to use and the variety of its applications is almost limitless.

Ask **FEDERAL** *First*

FOR RECOMMENDATIONS IN MODERN GAGES . . .

Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automation Gaging

Mail This Coupon Today!

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Please send information and prices on the Federal Testmaster.

Name ..... *Title* .....

Company .....

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.....

Special Size Reamers
ARE STANDARD WITH L&I

TWO MORE L&I EXCLUSIVES ...AT NO EXTRA COST!

DOWEL PIN REAMERS
Straight Shank, Right Hand Cut with Straight, Right or Left Hand Spiral Flutes.
14 Sizes from .1230 thru .4995" Sets, tool

OVER & UNDER SIZE CHUCKING REAMERS
Straight Shank, Right Hand Cut with Straight, Right or Left Hand Spiral Flutes.
14 Sizes from .124 thru .501" Sets, tool

These reamers are two more reasons why L&I is the source for a complete reamer line.
See your L&I Distributor.

L&I

"the reamer specialists"
LAVALLEE & IDE, INC.
CHICOPEE, MASS.

Letters...

To American Machinist
330 W 42nd St, N Y 36, N Y

The Good Old Days

Recently we had the pleasure of reading an old copy of your publication dated April 18, 1901.

It is interesting to note that, while the industry has made remarkable advances in this short span of time, human nature has not changed very much. This is borne out in an article by W Osborne entitled "Echoes from the Oil Country" on page 430. The author apparently operates a jobbing shop and has considerable difficulty in justifying his charges to his customers, who may or may not know their requirements or his problems.

In our operation of an experimental machine shop we work with many young engineers and occasionally experience similar situations. Suffice it to say, we were highly amused by his account.

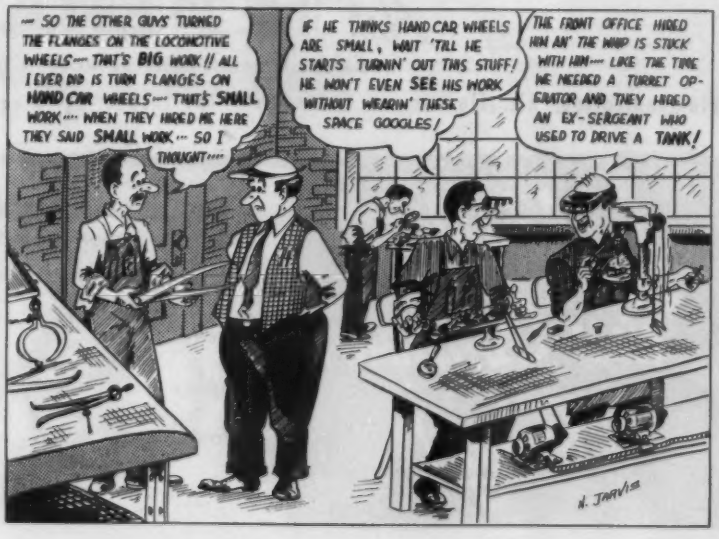
Frank P Urban
Clifton, N J

We were amused, too. Here is one of the situations from that article of 1901—Ed.

"Martin [a customer] came in and wanted a machine built; didn't have any machine or drawings or model to show; wanted it something like one he had, and also something different. He wasn't just sure where the like left off and the difference began, but could tell as the thing was being built. He wanted to know what it would cost to build it. Of course, as he couldn't guess just what he wanted, I couldn't guess what I could build it for, but told him I would build it by the hour. He then wanted to know at what rate. I told him 50 cents per hour. He laughed and said I was away up, as a neighboring shop had offered to do it that way for 40 cents per hour. Not to be outdone in friendliness, I gave him a price of 30 cents per hour. That seemed to please him, until he asked me how I could have had the gall to ask 50 cents at first. I explained that I would keep my 50-cent man for other work and give him a cheaper man for his job. This made him question the ability of the man, but, as I stood back of that, he seemed satisfied until I

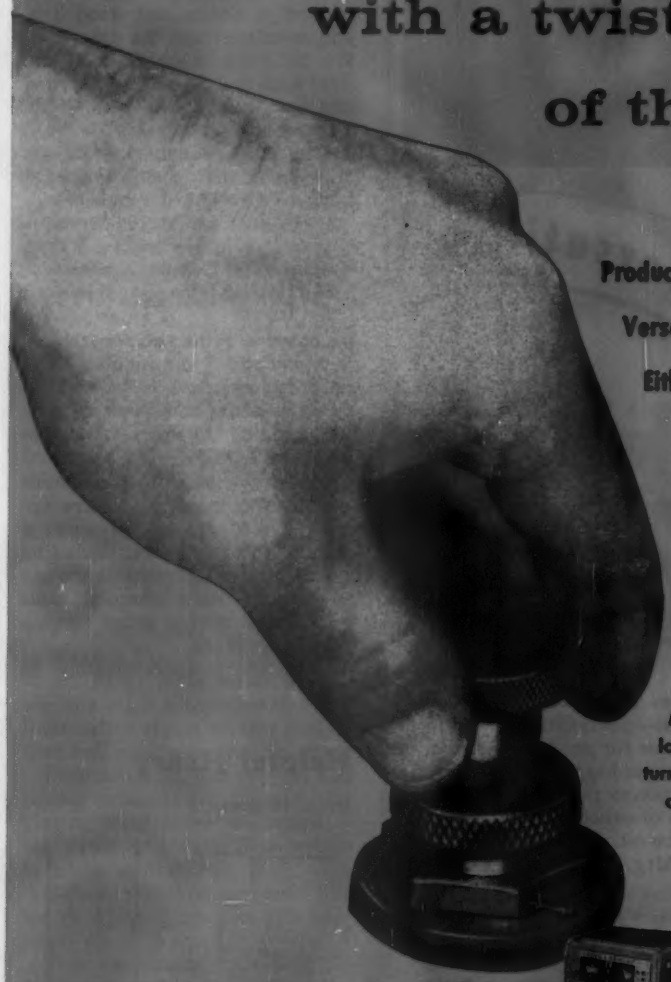
SHOPMATES

N. Jarvis


— SO THE OTHER GUYS TURNED THE FLANGES ON THE LOCOMOTIVE WHEELS— THAT'S BIG WORK!! ALL I EVER DID IS TURN FLANGES ON HAND CAR WHEELS— THAT'S SMALL WORK— WHEN THEY HIRED ME HERE THEY SAID SMALL WORK— SO I THOUGHT—
IF HE THINKS HAND CAR WHEELS ARE SMALL, WAIT 'TILL HE STARTS TURNIN' OUT THIS STUFF! HE WON'T EVEN SEE HIS WORK WITHOUT WEARIN' THESE SPACE GOGGLES!
THE FRONT OFFICE HIRED HIM AN' THE WHIP IS STUCK WITH HIM— LIKE THE TIME WE NEEDED A TURRET OPERATOR AND THEY HIRED AN EX-SERGEANT WHO USED TO DRIVE A TANK!
N. JARVIS

changeover

with a twist of the wrist



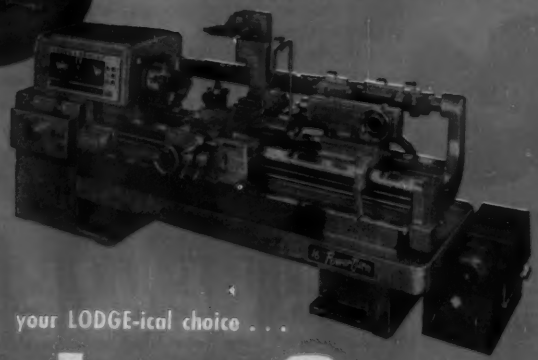
Productivity of a tracer lathe . . . .

Versatility of an engine lathe . . . .

Either instantly available!

Productivity by itself may cost money if you sacrifice versatility. But not with a Lodge & Shipley 90° COPYMATIC Lathe! This lathe combines COPYMATIC tracer control productivity with new POWERTURN engine lathe advantages. You get toolroom accuracy, engine lathe versatility and tracer lathe capacity without the high price tag you might expect.

Many COPYMATICS are used as engine lathes to produce a prototype part which, in turn, is used as a template for fast, tracer controlled production of the rest of the run. These lathes turn in records of production increases up to 536%, savings of 65% and more!



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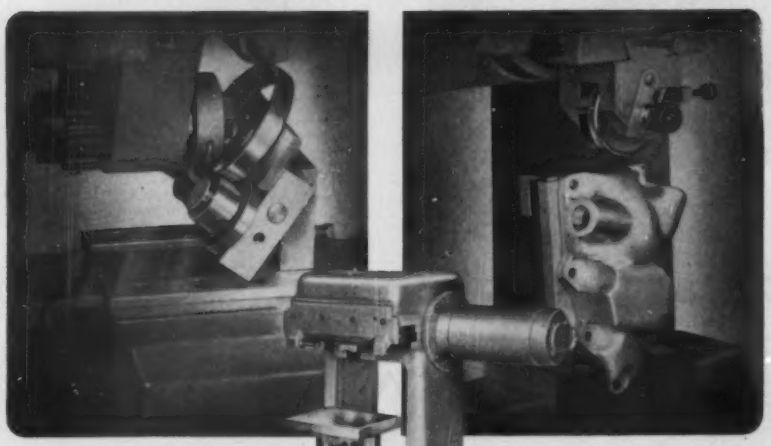
LEADERS IN INDUSTRY MARK WITH NOBLEWEST



Above left—Tooled for marking part numbers on the I.D. of steel rings—component parts for aircraft engines.

Above right—Tooled for marking aircraft engine rocker box covers.

ROLL-O-MARK'S Versatility

Speeds up metal marking

All-pneumatic Model 50P1

Whether it's an aluminum forging that requires a marking machine sensitive enough to provide a shallow mark without distortion—or the critical marking of the steel ring described above—Roll-O-Mark is ideal for the job.

Roll-O-Mark offers such outstanding features as—pneumatic table pressure for positive uniformity of impression—pneumatic operation of die slide—the Noblewest *roll-marking* process for producing sharp, permanently indented impressions that will last as long as the product itself . . . marking better, faster (up to 1200 pieces per hour), and at lower cost. It will pay you, as it has hundreds of other manufacturers, to put your marking problems up to Noblewest. For new comprehensive catalog, write Noble & Westbrook Mfg. Co., 17 Westbrook Street, East Hartford 8, Conn.

A mark is only as good as the die that made it. Noblewest marking dies are made by master craftsmen to exacting standards that result in clearer impressions and longer life . . . the ideal dies and die holders for production marking equipment.

MARK IT BEST WITH

NOBLEWEST IMPROVED MARKING DEVICES

NOBLEWEST

ORIGINATORS OF THE ROLL MARKING PROCESS

EQUIPMENT FOR MARKING · GRADUATING · EMBOSSING · NUMBERING

casually remarked that it might take a little longer to get the job done, and the finish would not likely be quite as good. This led him into a request for a comparative cost of having the work done by the different men. To this I replied that I could not tell just how much more the machine would cost if built by the 30-cent man, but would think about from 30 to 50%, that each was good of his class, but that I supposed he wanted a cheap and good job, and so offered him the dear man. We built the machine with the dear man, and now he kicks when his work isn't done with a 50-cent man, and wants a discount on his bills to make up for the cheap man. If I give it to him, I will have to cut the slow man's wages. What would you do?"

Moonlight Requisitions

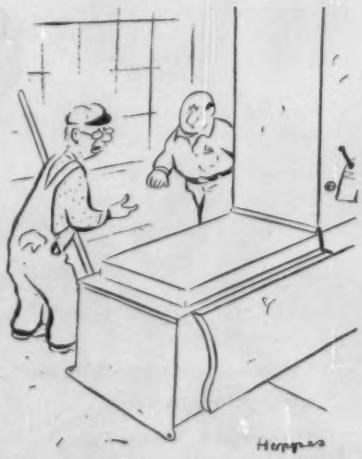
We have a rather acute problem in the handling and requisitioning of ordinary hand tools such as light wrenches and screw drivers. Our annual loss measures upwards of $1000.

Our problem is further amplified by the fact that we are operating continuously, 24 hours a day, 7 days a week, including holidays. This necessitates the use of a supply house where all tools are located during prime non-supervisory hours.

We employ approximately 25

Helpful Henry

by L. Hoppes



"I turned your shaper off. Didn't think you'd want it running while you were gone!"

men who must have frequent access to these tools. It would not be economical to hire a storekeeper on a full-time basis as this would increase our annual payroll by a figure much larger than our measure of loss.

We are writing to you in the hope that you may be able to explain ways and means to prevent the loss of simple hand tools. Any information which you can supply to us along this line will be greatly appreciated.

Name withheld

This reader has a real problem. It's a rather common one in small companies, but up to now, we haven't heard of a good, simple way to solve it. If he hires a storekeeper, especially on a three-shift basis, he may gain the satisfaction of knowing that he has thwarted pilferage, but he'll lose money doing it.

But does this mean there is no solution? Surely some of our readers have wrestled with the problem and have figured out a way to cope with it on a limited budget. We are open to any and all suggestions—Ed.

Who's Crazy?

The special report No 441, "How to Make a Sandwich" (*AM*—Mar 25 '57, p137) is, as far as we can see, the most comprehensive and informative report on this subject that has ever appeared in print.

Unfortunately, however, in this superb presentation there is one glaring error which we noticed—our company address is incorrectly given as Matawan, N J.

Matawan is where people like me go when things like this happen!

Your cooperation in noting the correct address will certainly be appreciated.

Bernard Gould
Rubber and Asbestos Corp
Bloomfield, N J

Reader Gould must be referring to the mental institution at Matawan, N J. That's not the only thing at Matawan, but, in his part of the country, the name has an unfortunate implication. The Rubber and Asbestos Corp, as noted above, is located in Bloomfield, N J—Ed.

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Have Threads Rolled Exclusively on

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Reed machines roll threads on the thin wall of spark plug shells with electrode already welded in place. Threads must be square with shoulder on part.

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Reed machines, used for both thread and form rolling, are made in 2 die horizontal and 3 die vertical and horizontal types for in-feed or thru-feed rolling. They are rugged, of compact construction, easy to set up, convenient and simple to operate.

Equipped for manual, semiautomatic or fully automatic feeding, Reed machines are suitable for both small job lots and large production runs.

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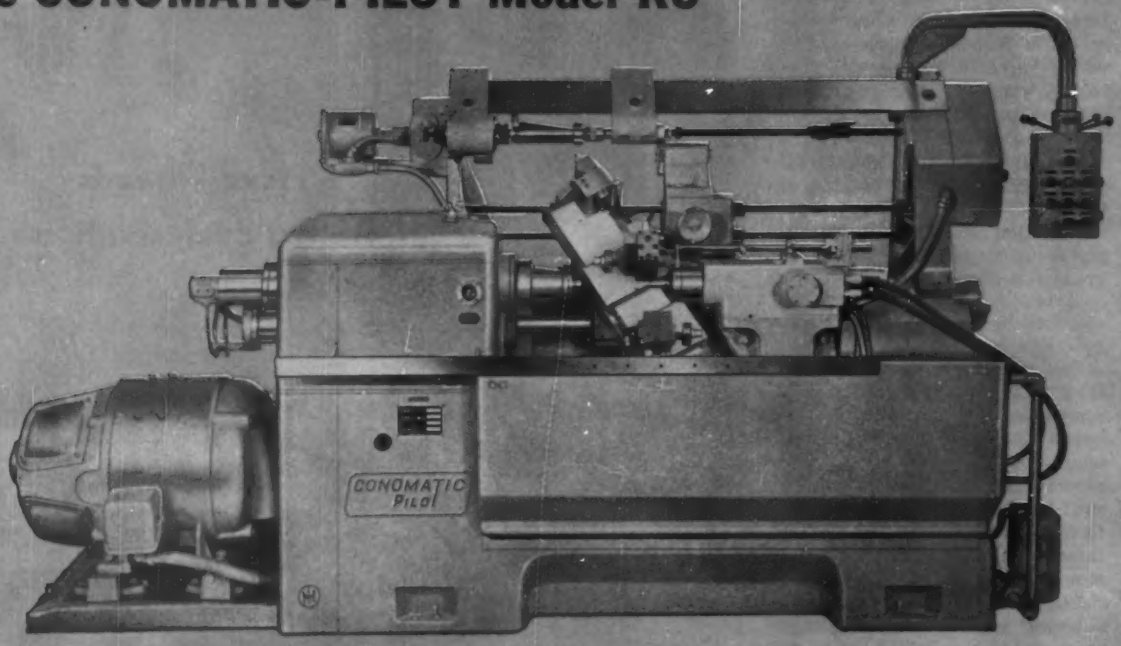
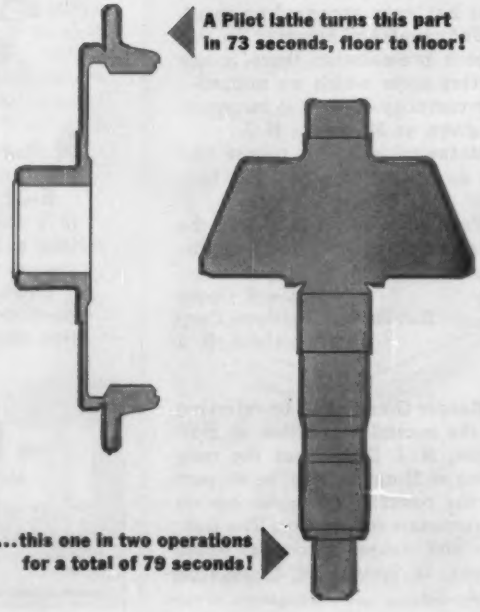
The CONOMATIC-PILOT Model KU



Cone Automatic is now manufacturing the world's most versatile copying lathe...

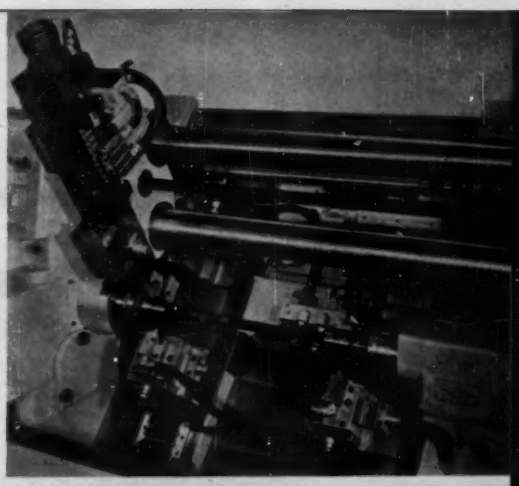
Cone Automatic Machine Company has acquired all rights to the manufacture and sale in the United States and Canada of the famous Pilot lathe. This hydraulically-controlled multicycling copying lathe has already proved its unique adaptability to automated production layouts in the plants of leading U. S. automobile producers and other manufacturers whose products require parts profile-turned to precise tolerances.

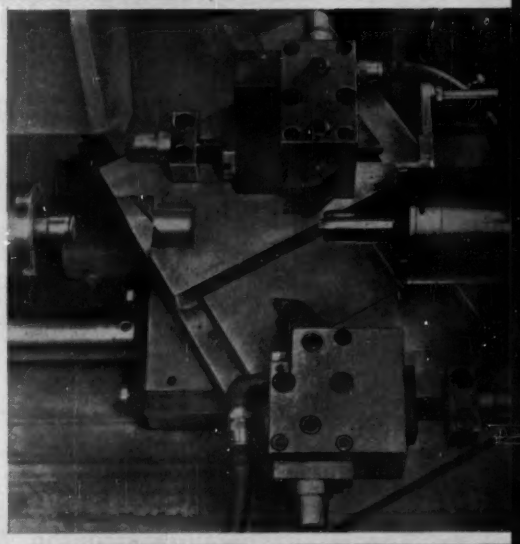
For more details, mail the coupon at the bottom of the right hand page today. We will send you a copy of the new Conomatic-Pilot Lathe Catalog. It's yours for the asking.

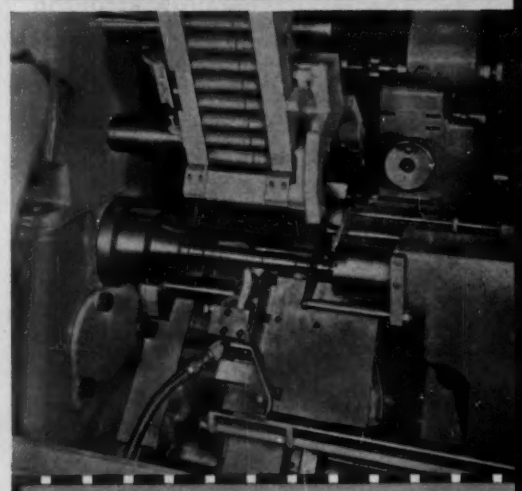


The Conomatic-Pilot KU offers:

- The advantage of a single-point copying lathe plus adaptability to virtually any number of tool stations. Top photo shows typical set-up.
- Smooth, even finish on all surfaces of the work piece: piloted hydraulic feed provides constant feed per revolution.
- Advantage of dual motion tool blocks when using 60° slide (see middle photo).
- Plenty of space near work area to mount automatic feeds and unloading systems. A typical automated arrangement is shown in the bottom photo.
- All cutting tools tangentially mounted for vibration-free operation.
- 45° inclined bed to ease chip removal—wear-proof nitrided steel slide ways.
- Rear tool blocks that can plunge-cut 90° shoulders or copy turn in reverse.
- Front and rear tool blocks that can copy different profiles from same motorized rotating template.







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Danly Presses meet the speed and volume requirements of expanding companies. They run at top stroking speeds around the clock . . . minimize breakdown delays . . . need only minimum maintenance. Even double action types maintain a single action pace, thanks to Danly's controlled stroke slowdown. Special drives allow stroking speed to be increased without exceeding safe drawing speed. No need to "gear down" your line when single and double action presses work together. Danly's faster pace saves important time in any shop.

JUST PRINTED. *New book discusses the effect of modern presses on profits and growth of metal-working companies. Request your copy of "Industry's Wealth-Builders" from DANLY MACHINE SPECIALTIES, INC., 2100 So. Laramie Ave., Chicago 50, Ill.*

DANLY

COMPANY _____

CITY _____ STATE _____

Spot news...

- **They've already started stamping parts for Ford's new Edsel line** at Ford's Chicago Stamping Plant. Edsels will be assembled in either Ford or Mercury plants at Mahwah, N J, and Somerville, Mass; Wayne, Mich, and Milpitas, Calif, and one more plant (still to be selected) on the West Coast. The Somerville plant will make Edsel's two top series, the Corsair and Citation, only.
- **Independent West Coast defense subcontractors are "deeply alarmed"** over extensive pullbacks in defense work by prime contractors. Worst hit are machine shops and tool and diemakers connected with aircraft output, who also suffer because guided missiles require less machining. Some tools paid for by taxes are reportedly being used in the pullback work by prime contractors.
- **Automakers are aiming at a car that will require only major repairs** done by the factory or by a factory service repesentative.
- **West Germany wants to train technicians for Indian industry,** has offered to set up a $535,000 prototype training establishment, which could easily be copied by small and medium-sized Indian plants. It's part of West Germany's drive to build up industrial markets in Asia and Africa.
- **Babcock & Wilcox will build the reactor for the first atom-powered merchant ship** under a $9.8-million contract from the Atomic Energy Commission.
- **Thin gold film sprayed onto almost any material** protects workers from heat at a German steel company. A layer 0.000040 in. thick is said to reflect 95% of all heat rays without affecting transparency of plastic goggles, shields, etc.
- **Titanium stockpiles are building up too fast for current demand,** to the point where at least one major producer has had to layoff some of its employees temporarily. Reason: almost 99% of Ti output goes into defense aircraft, but most planes requiring titanium components are still on the drawing boards. And until they go into production, Ti stocks are piling up.
- **We'll see more progress in the use of aluminum in autos next year** than we have in the last 10 years, automotive stylists say. Contrariwise, the aircraft industry during the same period will lean heavily toward replacement of aluminum with tool and alloy steels.
- **Electricity may some day heat-treat metals directly,** without going through heating coils—if Germany's new "glow-discharge" principle works out (voltage similar to that made by a Van DeGraff generator would be raised without causing an arc). High-current glow discharge converts electricity directly into heat, and steel has been hardened in such a field.
- **First Southwestern Metal Congress & Exposition** will be held May 12-16 next year in Dallas by the American Society for Metals.
- **Fully automated plant for machining, inspecting and assorting aluminum pistons?** That's what a prominent machine tool builder has been asked to build and manage for a leading automaker. Unwillingness of the machine tool builder to take on the management of the plant is said to be the reason why the deal has been stalled for months.

Spot index to major News stories...

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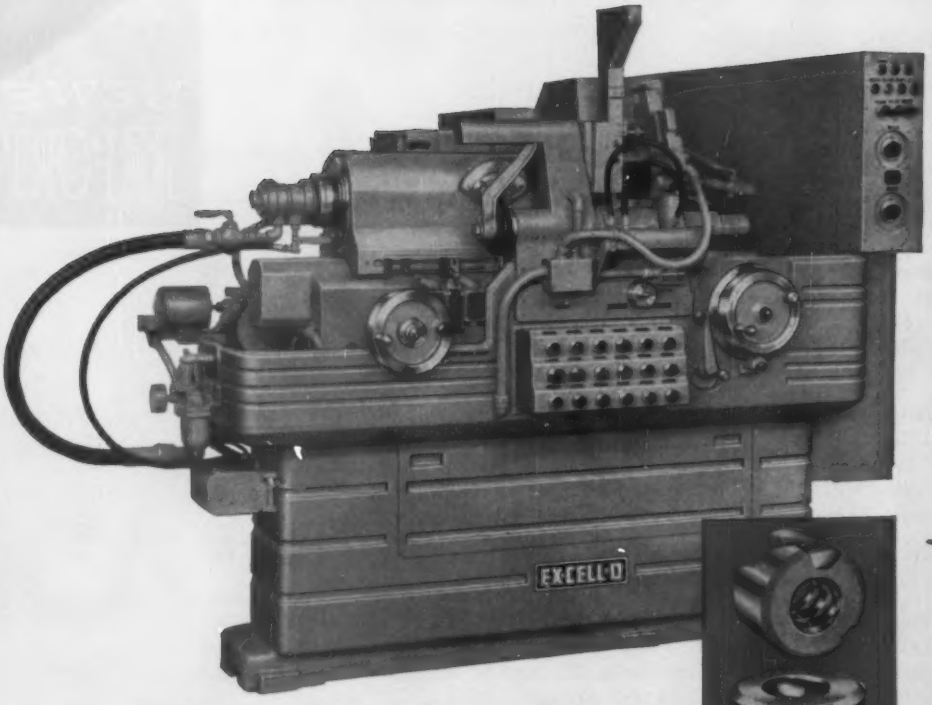

Ex-Cell-O Style 39-A Precision Internal Thread Grinder equipped with automatic work handling equipment. This machine loads, locates, grinds threads and ejects steering gear ball nuts in a completely automatic cycle.

Short Runs, High Production, or Automation with Ex-Cell-O Thread Grinders

These standard machines are grinding thread gages, machine tool lead screws, innumerable aircraft parts, automotive steering mechanisms and pinions, worms, taps, and many similar workpieces.

Precision thread grinders in this Ex-Cell-O line range from manually-operated models, for toolroom and for short runs, to high production automatics, to styles equipped with automatic work handling equipment. There are five models designed to meet your every requirement.

For specific information, call your local Ex-Cell-O representative.

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MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

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EX-CELL-O STYLE 33 FOR EXTERNAL THREADS: An accurate production machine; automatic except for loading, unloading, and moving the cycle lever. Can be arranged for tapered grinding and for eccentric relief grinding.

EX-CELL-O STYLE 36 FOR LONG EXTERNAL THREADS, also available with internal attachment. A high production machine with easily adjusted work cycles.

EX-CELL-O STYLE 50: A versatile machine for external work . . . also available with internal attachment.

EX-CELL-O STYLE 120: Our largest Thread Grinder. Grinds 10 feet of thread in one setting. Accommodates 12 feet of stock between centers.

XLO

NEWS REPORT

Washington ...

BDSA budget slash . . .

The House's 25% cut in the administration's new budget for the Commerce Dept will mean the elimination of the dozen-odd industry divisions in Business & Defense Services Administration —including the Metalworking Equipment Division, which has reflected industry views in administration of the government's machine tool program. It's likely, though, that the Senate—as in past years—will put back the funds if BDSA's industry divisions are eliminated. However, the agency will still have a small staff of experts to handle industrial mobilization and related matters.

Inter-service IRBM squabble . . .

The Army-Air Force fight for control of the IRBM is about to make the headlines again. The new issue: an emotion-charged court-martial of Colonel John C Nickerson, Jr, army missile expert, charged with violating security regulations and committing perjury. The Colonel allegedly leaked secrets about the IRBM program in an unauthorized blast at Defense Secretary Wilson's recent order limiting the Army to missiles with a range under 200 miles, though theoretically keeping its 1500-mile Jupiter Project alive.

Behind the drama of the Nickerson case, it's now clear that the Chrysler-Ford Instrument Jupiter Project is being shelved in favor of the Air Force's Thor IRBM (Douglas, North American, GM's AC Spark Plug, etc).

Impact of British defense plans . . .

Washington officials say that as of now Britain's drastically revamped military program will have little if any immediate effect on U S defense policy. Yet they fear that other NATO member nations will try to follow Britain's example. If such cutbacks are made in Western Europe, it seems likely that U S commitments to NATO will be altered—not necessarily by sending new forces there but by shelving proposed U S withdrawals.

Meantime, Britain's action has sparked dissimilar arguments that the U S should:

• **Be as "realistic" as the British** and start pruning its own defense program. Growing military costs should be trimmed—or at least stabilized. There's no justification, this line goes, to maintain as many as 17 Army and three Marine divisions (since a much smaller conventional force could handle limited wars), or to run costly development projects for weapons with duplicate strategic objectives—like manned bombers and long-range ballistic missiles.

• **Spend more for arms and manpower** to take up the slack created by the British cutbacks. This would postpone planned reductions in U S ground forces and tactical air forces.

But until the reaction of NATO's other nations to Britain's heavy arms cutback becomes clarified, Washington won't say what it will do. Meanwhile, however, the U S is gently pressuring its allies to hold back force reductions.

The British are committing themselves to a revolutionary shift in military strategy, aimed at scrapping conventional forces to fight a war, and placing almost total reliance on nuclear weapons. **The objective is to halt the strain** of heavy military expenditures on the hard-pressed British economy, and to shift skilled manpower into expanding civilian industry—mainly for export of hard goods.

Over the next year, Britain will slash military spending by 20%, withdraw 13,000 of its 77,000 men in West Germany, and start reducing naval and air forces and overseas garrisons. By 1962, plans are for still larger withdrawals from NATO's force in West Germany, an end to Britain's military draft, and overall reduction of British armed forces from 690,000 men to 375,000, and severe cutbacks in production of planes and other conventional military goods.

To some extent, you can say the British are adopting with a vengeance the trend in U S strategic plans for the past four years—which has seen U S armed strength become concentrated in strategic bombers, missiles, nuclear explosives, and other new arms.

But pushed by economic need, the British are trying to step more swiftly and boldly into the nuclear-missile age. The U S still maintains sizeable forces to fight conventional non-nuclear wars and spends heavily to improve both current types of arms—manned bombers and fighters—and to develop a new generation of missiles.

The British now say they cannot afford this extra factor of safety—overlapping generations of arms. They're engaged in a long-range gamble, are putting all their chips on pushbutton nuclear weapons of the future. As they see it, if their calculations go wrong, U S strategic airpower is there to back them up.

So all work on new bombers and fighters is to be stopped. The current supersonic crop of medium V-bombers just going into service is to be the last for Britain. English Electric's P.1B supersonic plane, which has just made its first flight, will be the last of Britain's manned fighters.

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On the shelves of your local Industrial Supply Distributor

Detroit ... NEWS REPORT

Delayed pickup renews optimism . . .

More cars were sold in the last 10 days in March than in any 10-day period in 1956—a situation that is prompting no little enthusiasm and optimism over 1957's sales prospects.

Although the spring market hasn't lived up to expectations, the auto industry is beginning to breathe a little easier as a steady groundswell of sales builds up. The year still looks good.

Be that as it may, there's an indication that the entire industry may grant its dealers a longer cleanup session this year. This will have a definite bearing on third-quarter production. It could mean that third-quarter output will be cut back to let the dealers empty their showrooms before the new models appear.

Reports are that Ford will introduce its 1958s as much as three weeks later than last year—and **Chevrolet will be two weeks later,** contrary to earlier reports. Plymouth will stick to its same-time-as-last-year schedule, which would put the Big Three close together in introductions.

Ford is beginning to show a slight slowdown in its mad production race with Chevrolet. Last week, for the first time since the 1957 models were introduced, Ford Division scheduled no Saturday work. Daily production is now down to 6000 cars, compared a previous norm of 6500.

Mercury, too, has cut daily output from 1600 to 1300 units. And Lincoln is on a five-day week.

Over at General Motors, Chevrolet picked up to a five-day week after being on four days for more than a month. Pontiac has tapered off slightly and Oldsmobile isn't up to predicted output, what with production falling off 8% in a single week. Buick is back on a five-day schedule. Cadillac is staying at March levels.

At American Motors, March production was off 28% or so from March 1956 levels, and first quarter output is off 41.6% from the 1956 equivalent. Nash output is down 80% for the first quarter, Hudson 79%, and Rambler 26%. AMC's one bright note: Rambler assembly has risen steadily month by month since the beginning of 1957.

Studebaker-Packard production is still on the upswing, but lags behind the 1956 pace.

Chrysler is suffering from a public announcement by Norman Mathews, head of UAW's Chrysler locals, to the effect that the union will eliminate all overtime to "bring Chrysler to its senses so that the Los Angeles assembly plant strike can be settled." Chrysler hasn't issued any statement defending its position, even though Mathews admits the union move violates its contract. If the union pushes this move, Chrysler production and sales will suffer greatly. Chrysler still faces the possibility of a company-wide strike if the union strikes the Dodge forge plant.

Mr Reuther gets his way . . .

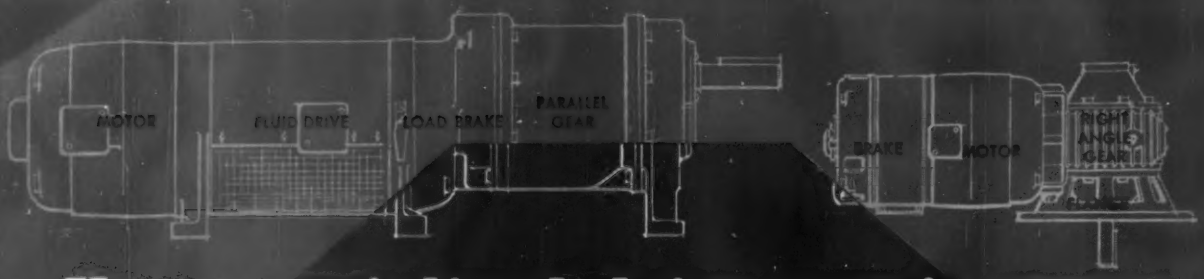
If ever a convention was in one man's pocket, it was UAW's recent one in Atlantic City. The pocket, of course, is Walter Reuther's. And here's what he has in it for 1958:

- **UAW will go to the bargaining tables** with the "biggest payment demand ever" all tied into a neat package with a 36-hour workweek. This may come as a proposal to increase work productivity standards 2% per year, and decreasing time worked by the same amount. That means that in eight years the workweek would be 34 hours, in 10 years 32 hours. Alternatively, Reuther may ask for a flat 36-hour week, with everything over that counting as overtime.
- **"Runaway plants" will get a stiff going-over** from UAW bargainers in 1958. If a man doesn't want to move with his plant to a new location, the union wants him to get severance pay. If he goes along with the plant's move to a new town, UAW wants the employer to pay all moving expenses, to lend him down-payment money for a new home if necessary, and to guarantee he doesn't lose money in selling his former home. And if the actual need for a company to move can't be proved to UAW's satisfaction, a sitdown strike will be called.
- **Supplementary unemployment benefits** may go to 65% for 26 weeks, and severance pay may become a part of SUB benefits.
- **Health plans would be extended much farther** than any of today's prepaid health plans, with management footing the whole bill.
- **UAW may request a Congressional investigation** of auto pricing to prove auto companies don't have to raise prices when wages are raised.

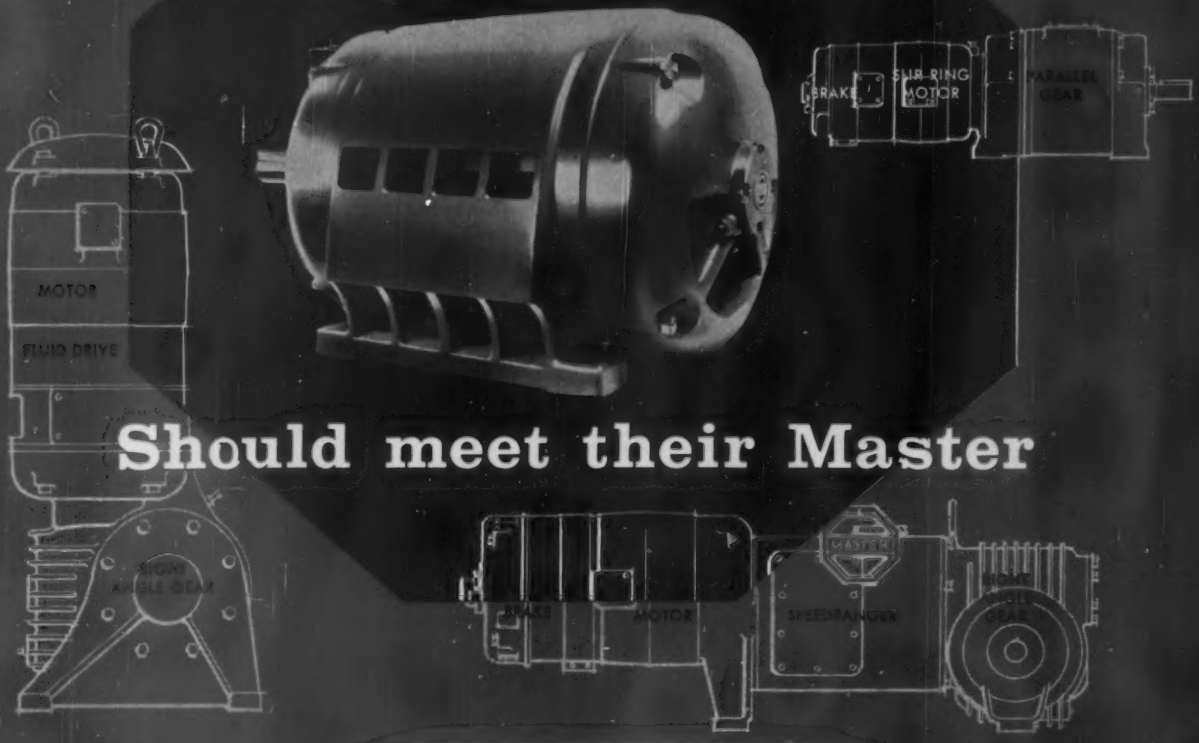
UAW will move to give its skilled trades groups, office workers and technicians a right to bargain separately. This would only apply, though, in unions where those categories have sufficient numbers to make separate bargaining practicable.

That's going to put management behind the eight ball. A firm will get the production workers all lined up to sign a contract, then along will come the skilled trades group demanding extra pay. **If and when they get it,** the first group will then demand equal rights, then the second group will renew its extra pay claims, ad infinitum.

NEWS



Your specialized drive requirements



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Master Units Combine into Engineered, Customized Package Drives—Providing the Right Shaft Speed, the Right Construction Features, the Right Mounting. Why Put Up With Makeshift Assemblies?

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Electric Motors	**⅛ to 400 H.P.**
Gearmotors	**⅛ to 125 H.P.**
Variable Speed Drives	**⅛ to 30 H.P.**
Unibrake Motors	**⅛ to 150 H.P.**
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Alternating current motors, direct current motors, generators . . . open, enclosed, explosion proof . . . with 5 types of gear reducers . . . with electric brakes . . . with mechanical or electronic variable speed units . . . with fluid drives . . . Master has them all and so can be completely impartial in helping to select the one best drive for you.

MASTER ELECTRIC MOTORS

THE MASTER ELECTRIC COMPANY, Dayton 1, Ohio

NEWS REPORT

Machine tools ...

Big orders placed by automakers . . .

Detroit is far from being out of the market for machine tools. Just within the past few weeks one of the big automobile makers placed orders running into millions of dollars for equipment for production of a newly-designed component for its 1959 models.

A builder of special machine tools got the major portion of this business, thus bringing his backlog up to a full year's output.

Later on this year, more orders for 1959 models, to be introduced in the fall of 1958, will go to machine tool builders. But admittedly the total volume of machine tool sales originating in the automotive field is well below last year's figure up to now.

Builders of "specials" doing well . . .

Special-machine builders seem to be doing very well. One company reports both orders and shipments in the first quarter double those in the same period a year ago. It expects new business to stay strong all year and well into 1958. Automotive customers form the bulwark of the company's volume.

Net orders were off around 30% in the first quarter compared with a year ago, another special machine builder reports. The management sees little improvement until fall. It is processing a large number of inquiries from good prospects, however.

Company's shop nevertheless is loaded with work that will carry it at full capacity all year.

Builder of standard machines states that orders and shipments are higher than last year. Backlog is heavy too. Major part of his business is being done with the smaller shops which have discovered that "they have to keep in good working order to stay profitable under today's competitive conditions." Makers of road-building machinery are among recent sizable purchasers of machine tools.

Two makers of standard machines say that new orders are off sharply. One attributes the drop to two factors: 1) most customers' depreciation reserves are based on equipment bought 15 years ago and hence are inadequate in relation to today's prices; and 2) profit margins of machine shops are being squeezed, leaving them short of working capital.

The other company declares that it can sell special machines that cut hours or costs, but not general-purpose tools.

More and more builders are blaming tight money for the failure of sales this year to hold up to last year's level. Most companies also comment that they have never been busier on inquiries. But it is considerably harder than it was in 1956 to turn an inquiry into a firm order.

Hanover Show to be largest ever . . .

Demand for display space at the European Machine Tool Exhibition at Hanover, Germany, September 15-24 is 25% above the record set at Milan in 1954. Total of 520,000 sq ft of stand space has been taken. Detailed information will be in hands of exhibitors before May 1.

Count G Motta of Italy has been reelected president of the European Committee for the next two years. Serving with him as vice presidents will be E Pouvreau of France, Robert Asquith of Great Britain, G Fischer of Switzerland, Dr G Schaudt of Germany and F Leblanc of Belgium. Hermann Heller is Commissioner-General of the 1957 European Show.

Russia sets new record . . .

Russia is reported to have built 121,300 metal-cutting machine tools in 1956, an increase of 4% over the previous year. Some 21,800 special-purpose and transfer-type machines are included in the total. This represents a gain of 30%. Output of presses and power hammers added up to 6900 units, more than one-quarter greater than in 1955.

East German machine tool builders made a bid at this spring's Leipzig Fair for a bigger share of the western European and Latin American markets. They claim to have increased their exports to the West by 50% in the past year, though no specific figures were quoted.

A fair number of West German builders exhibited at Leipzig, making a vigorous play for business from the communist bloc. For detailed story and pictures from Leipzig, turn to p170.

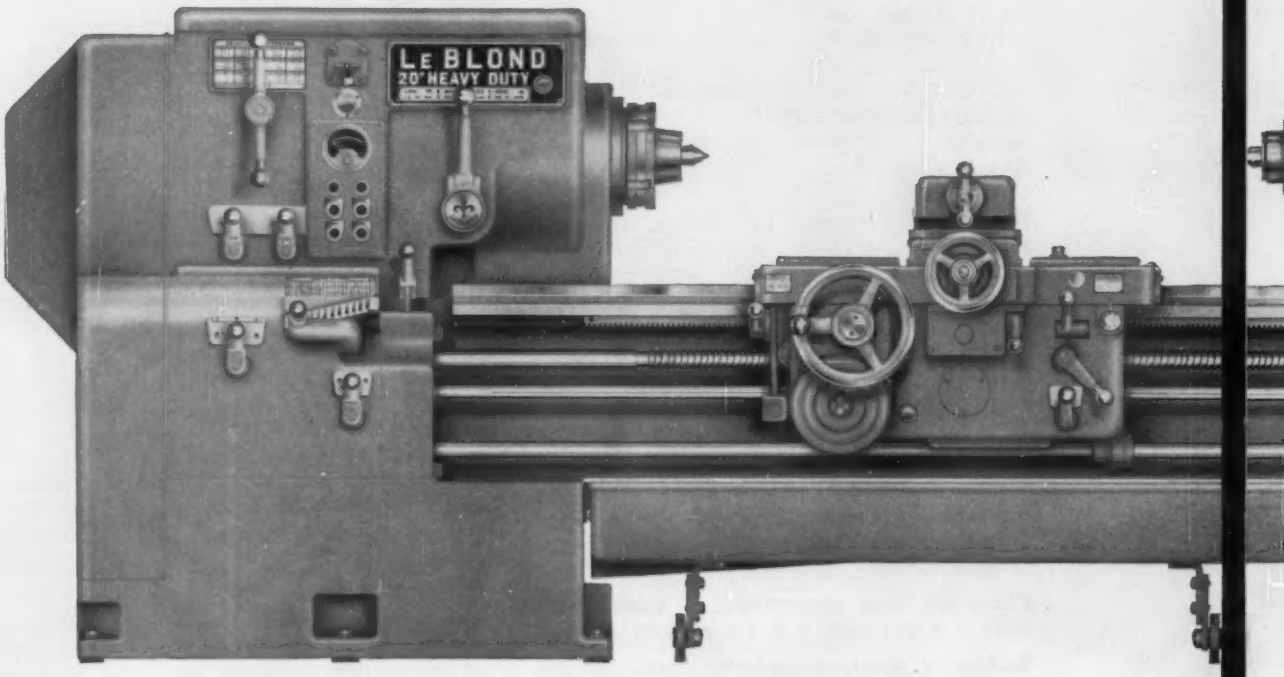
China to build 27,000 machines . . .

China's production of machine tools is expected to be 27,000 units this year, or double the planned number. Some 140 new types of machine tools are to go into production in 1957. Today, 34 different types of grinders are being made, against only five in 1952.

ALLNEW

20" Heavy Duty

power and toughness to use all the



The new LeBlond 20" gives you all the rugged design and construction of the toughest heavy duty turning machines in the world. Power, rigidity, stamina—dramatic new features and new human-engineered operator convenience. Here's why you'll want LeBlond 20"s fighting the production battle on *your* side!

Smooth, usable 40 H. P.—to get the most from today's advanced tools! In the headstock, extremely short, heavy shafts and fine-pitch precision-ground gears deliver power efficiently to the spindle—with minimum no-load horsepower. Plenty of power at lowest speeds, too! For example, *at 10 rpm you can take a cut as deep as ½" in 16" diameter work, feeding at .063 ipr!*

36 high-power speeds. Selections made in fine increments, particularly in the low range where small differences in rpm make big differences in tool life. 36 speeds, 10 to 1300 rpm in geometric progression. The tough, forged spindle is supported in 3 places by 5 bearings. DC speed selection at apron available with simplified gearing in head.

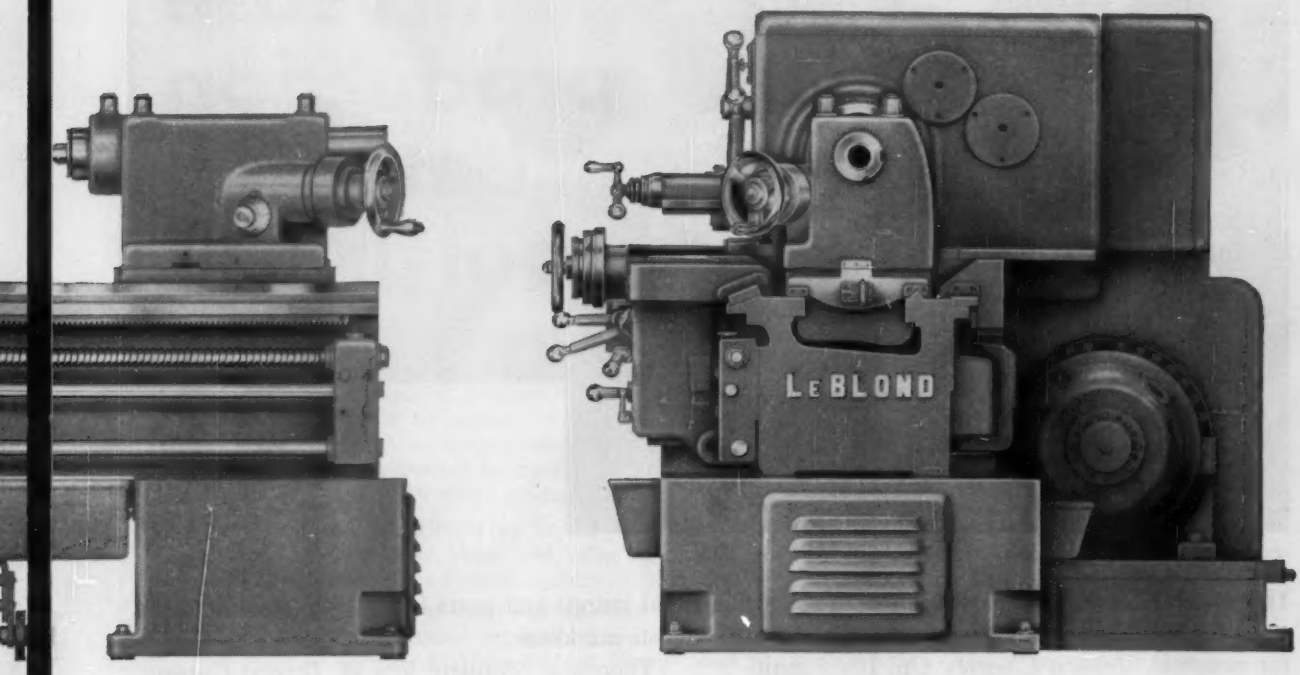
All-new 2-speed tailstock. Tailstock spindle travel is geared for conventional and low speed. When drilling, for example, push handle *in* to drill at slow, powerful feed; pull handle *out* to retract quickly. Tailstock can be moved by power. Exclusive LeBlond worm and rack construction puts handwheel at a convenient angle to the operator, provides exceptionally long travel and positive safety lock against thrust. Full-length support of spindle, even when extended.

Scientifically planned operator convenience. Human-engineered for operator convenience, the controls of the

LeBLOND

Engine Lathe

bite of today's ceramics and carbides!



new LeBlond 20" were scientifically studied for shape, size and location. To simplify speed and feed selection, levers are always moved toward operator position for increase, away for decrease. Speed selection is color coded. Spindle is sensitively controlled by means of electric clutch and brake. 4-directional power rapid traverse controlled by single lever. In addition, built-in horsepower meter, chasing dial integral with apron and quick-setting diameter reading dials on crossfeed.

Many famous LeBlond features. Hardened and ground replaceable steel bedways with compensating vee-way design, automatic lubrication to head, quick-change box, apron, single-shot to tailstock, hardened and ground crossfeed screw with compensating nut, one-piece apron, flame hardened rack, totally enclosed quick-change box.

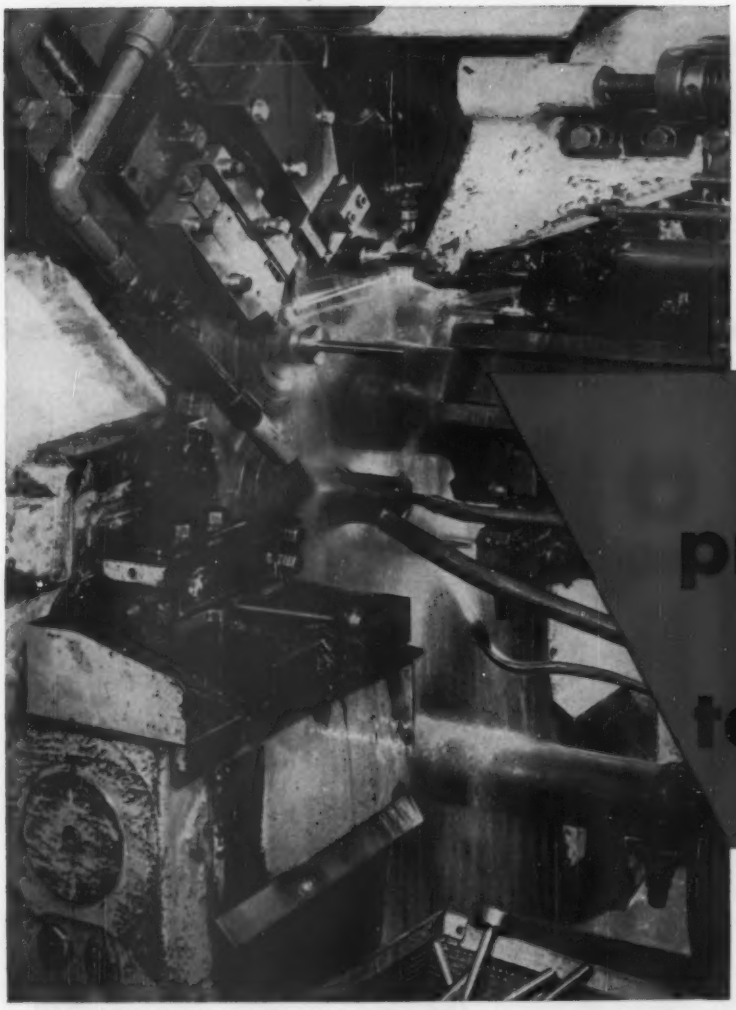
...cut with confidence

Call your LeBlond Distributor or write for complete specifications.

LeBLOND of Cincinnati

THE R. K. LeBLOND MACHINE TOOL COMPANY

Cincinnati 8, Ohio



Automatic screw machine, producing pump parts, has used dual-purpose *Texaco Cleartex Oil B* most successfully as cutting oil and machine lubricant, for over seven years.

Increase production between tool grinds

THE RIGHT LUBRICANT can do a lot toward speeding production, increasing tool life. Take, for example, *Texaco Cleartex Oil*. It's a multi-purpose oil—cutting fluid and machine lubricant—with relatively high extreme pressure properties. Good stability and load carrying ability mean less wear on moving parts. And it's clear and transparent for faster, easier inspections.

In hydraulic systems, use *Texaco Regal Oils R&O*. They're the oils with so much more oxidation resistance than ordinary turbine-quality oils. They prevent rust, sludge and foam. You'll find pumps and parts last longer—maintenance costs are lower.

There's a complete line of *Texaco Cutting, Grinding and Soluble Oils* available to help you do all your machining better, faster, and at lower cost. Your nearby Texaco Lubrication Engineer will be glad to suggest those best suited to your job. To find him, just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO CUTTING, GRINDING, SOLUBLE AND HYDRAULIC OILS

TUNE IN . . . METROPOLITAN OPERA RADIO BROADCASTS EVERY SATURDAY AFTERNOON

What's ahead ... in Metalworking

NEWS REPORT

First half ahead of year ago . . .

Metalworking production in the first half of 1957 will exceed by a small but comfortable margin the volume of output in the same six-months' period in 1956. This estimate is based on manhours worked, not on dollar volume artificially boosted by price increases.

American Machinist Index seems pretty certain of averaging around 177-178 from January 1 to June 30. That is 10 points higher than in the same period a year ago.

Metalworking still is enjoying the solid support of the capital-goods industries, which, despite a fall-off in orders, are turning out machinery and other durable products at a very high rate.

The aircraft and related defense industries are contributing strongly to Metalworking's amazing performance this year. For a second year in succession, the failure of the auto industry to attain near-peak volume has not caused the tailspin in metalworking that it used to.

Demand for light steel tapers . . .

Failure of the automobile industry to take its accustomed share of tonnage has proved a big disappointment to makers of flat-rolled steel in particular. Some mills gloomily predict that a real pickup in Detroit business won't come until fall, when 1958 model production begins.

Warehouses have built up as much as a six-months' supply of sheet and strip, twice the normal amount, as a result of this situation.

Forward buying of steel has lessened notably as supply and demand got into balance and deliveries shortened. Nevertheless heavy steel products—structurals, heavy plate and pipe—are in stiff demand and will continue so.

Bethlehem predicts capacity operations through the first half of the year.

Sales of heavy castings holding up . . .

Gray iron foundries are active but uneven in their operations, with producers of heavy castings doing better than light-casting shops. The slowdown in the appliance and auto industries has hurt the latter. Output currently is at about 80% of "maximum commercial demand."

Heavy-castings business is feeling the good effects of orders from road equipment builders. Buyers of light castings are living off inventories to a considerable extent. But they are expected to be in the market in a big way during the second half.

Volume of commercial stamping production is expected to run ahead of last year by 10%. In 1956 the average stamping plant enlarged its physical capacity by 28%. Stampers complain about the squeeze on profit margins.

Tool and die volume rising . . .

Outlook in the contract tool and die industry is excellent, despite spottiness in Detroit. Year's dollar total may well end up ahead of last year's.

Heavy competition in the appliance field is likely to bring on extensive retooling.

Ford is reported letting some tool and die work for 1959 models, while the whole auto industry has begun tooling for 1958 models.

Guided missiles makers are looming more important as a source of tool and die business.

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AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	MAR. Estimated	FEB. Preliminary	JAN. Revised	FEB. Year Ago
Total Index	**179**	**180**	**180**	**168**
Machinery	157	156	148	
Electrical Machinery	201	207	192	
Autos	140	146	139	
Other Transportation	368	352	310	
Other Metalworking	144	143	139	

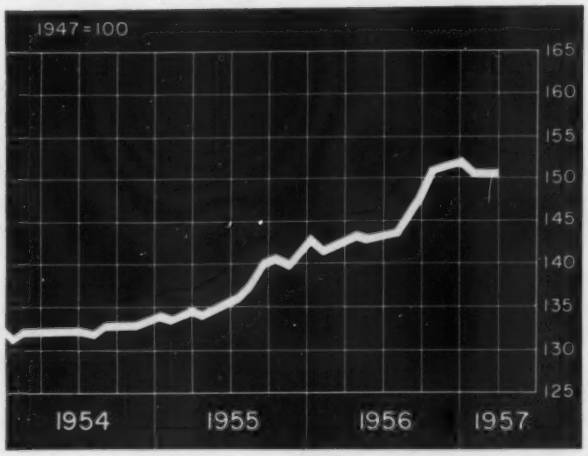
NEWS REPORT

What's ahead . . . in Business

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	MAR Estimated	FEB Preliminary	JAN Revised	FEB Year Ago
Total Index	**152.0**	**151.4**	**151.1**	**141.9**
Metalworking Machinery	**174.6**	**174.5**	**161.5**	
Other Machinery exc. Electrical	**159.9**	**159.7**	**148.3**	
Electrical Machinery	**153.1**	**152.0**	**137.6**	
Fabricated Metal Products	**143.3**	**143.1**	**136.5**	

152



Now it's up to the salesmen . . .

For the last six months or so, industrial production has been moving sideways. Retail trade, too, has stayed almost exactly at October 1956 levels, allowing for seasonal adjustments. Wholesale prices have changed only 1% since then, and unemployment remains about the same.

In other words, much of the economy is rolling along at a steady, high level. It could stay that way for some months to come. Alternatively, consumer goods sales could boom, carrying industrial output along with it. Or industrial output could suffer a letdown as buyers who aren't being sold hang on to their pursestrings.

That puts the problem squarely up to the nation's salesmen. If they get out and do an A-1 selling job in the next few months, 1957 could well be our top peacetime year. Admittedly, selling can be a tough job these days in the face of the price increases made in 1956.

But the market potential is certainly around. The economy is carrying on steadily at a generally prosperous level, and there's every reason to believe it will do so through 1957—in spite of recent stock market jitters, a notoriously poor gage of business conditions anyway.

At last report, U S personal income was running at an annual rate of $335 billion—that's $18.5 billion higher than it was in 1956, and $11 billion more than it was just six months ago. Income is bound to rise still further because at least five million U S workers will get automatic wage boosts of 6-8¢ per hour this year.

Trouble is, people are less eager to buy goods and services than in free-spending 1955.

Again, the buying power is around. Now it's up to the nation's sales force to get the public into a buying mood. It'll mean the difference between a sideways economy or a booming one.

WEEKLY BUSINESS INDICATORS

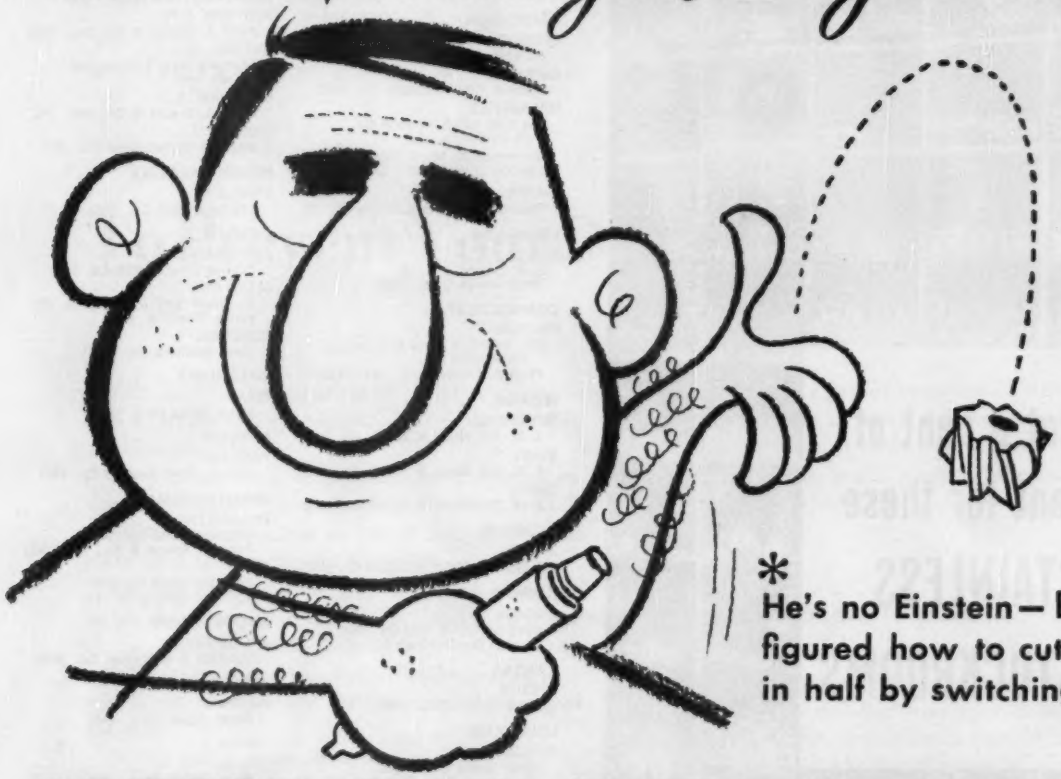
	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-49=100)*	145.8	146.7	149.6
Steel ingot production (thousand tons)	2,328	2,319	2,483
Electric power output (million Kilowatt hours)	11,693	11,694	10,846
Production of automobiles and trucks	167,538	164,151	170,867
Engineering construction awards (Eng. News-Record, millions)	$344.5	$281.5	$529.8

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Refrigerators sales (thousands of units)	290	247	292
Vacuum cleaners sales (thousands of units)	277	281	302
Washers sales (thousands of units)	331	298	394
Household electric ranges sales (thousands of units)	51	114	110
Radio production (thousands of units)	1,086	1,715	1,079
Television production (thousands of units)	450	627	588
Gear sales index (1947-49=100)	259.3	235.7	245.5
Foundry equipment new orders index (shipments, 1947-49=100)	117.9	115.6	195.6

* Seasonally adjusted.

*Now they call Joe a genius**



* He's no Einstein — but he figured how to cut costs in half by switching to...

NEW T-J REAMERS

with *throw-away heads!*

You don't have to be a wizard at figures to see how the new T-J Reamer with Throw-Away Head cuts your replacement costs to *less than half*. You *save* because you replace *only* the part that wears out. Buy original shank . . . change the head in a jiffy when worn. Wide range of head sizes from ½" to 2¾" inclusive, in 1/16" increments available with right or left hand spiral flutes for thru or blind hole reaming.

Tapered hole in head insures concentricity and *new* thread design assures a snug fit on smoothly ground tapered shank. Reamer operates free from binding or sticking due to cutting portion wearing undersize and creating negative relief. It's a product of T-J's 39 years of know-how as one of the largest manufacturers of die sinking milling cutters. Tomkins-Johnson Co., 617 North Mechanic St., Jackson, Mich.

1–Cuts replacement cost to less than half!
2–Quick change of heads saves time.
3–Wide range of sizes.
4–Head and arbor firmly locked together.
5–Easy to change heads for different metals, increases efficiency.

Left hand spiral, right hand cut.

Right hand spiral, right hand cut.

★Exclusive, high potential territories open to responsible manufacturers representatives. Write today!

T-J TOMKINS-JOHNSON

DIVITORS · AIR-AND HYDRAULIC CYLINDERS · CUTTERS · CLINCHERS

Here's how to have Armco Stainless Steels *when, where,* and *how* you need them — without paying one cent of rent for storage:

Just let the warehouse of your nearest Armco Stainless Distributor be your stockroom.

He'll deliver stainless in the exact grade, size, shape, and finish you require—and do it quickly. He is also ready to give you valuable assistance in stainless selection and fabrication.

Whether your requirements for stainless include sheet, strip, plate, bar or wire, you can take advantage of this cost saving service today. Chances are, one of these warehouses is located near you. And perhaps an Armco Stainless Steel Distributor's sales office is even closer. Either is as handy as your phone.

Distributors of Armco Stainless Steel

Key: (A) Sheet, Strip, and Plate; (B) Bar and Wire

ARIZONA
PHOENIX
Ducommun Metals & Supply Co. (B)

CALIFORNIA
BERKELEY
Ducommun Metals & Supply Co. (B)
EMERYVILLE
Electric Steel Foundry Co. (AB)
LOS ANGELES
The Cold Metal Products Co. of California (AB)
Ducommun Metals & Supply Co. (B)
Electric Steel Foundry Co. (AB)
NATIONAL CITY
Ducommun Metals & Supply Co. (B)

COLORADO
DENVER
C. A. Crosta, Inc. (A)
Metal Goods Corp. (AB)

CONNECTICUT
HARTFORD
The American Steel & Aluminum Corporation (AB)
Peter A. Frasse & Co., Inc. (AB)

FLORIDA
JACKSONVILLE
J. M. Tull Metal & Supply Co. (AB)
MIAMI
J. M. Tull Metal & Supply Co. (AB)
TAMPA
J. M. Tull Metal & Supply Co. (AB)

GEORGIA
ATLANTA
J. M. Tull Metal & Supply Co. (AB)

ILLINOIS
CHICAGO
Central Steel & Wire Co. (AB)
Chicago Steel Service Co. (B)

KANSAS
WICHITA
Metal Goods Corp. (AB)

LOUISIANA
NEW ORLEANS
Metal Goods Corp. (AB)
The Orleans Steel Prod. Co., Inc. (A)

MAINE
AUBURN
Brown-Wales Company (AB)

MARYLAND
BALTIMORE
Seaboard Steel & Iron Corp. (B)

MASSACHUSETTS
CAMBRIDGE
Brown-Wales Company (AB)
Industrial Stainless Steels, Inc. (B)
FALL RIVER
Congdon & Carpenter Co. (AB)

MICHIGAN
DETROIT
Central Steel & Wire Co. (AB)

MISSOURI
KANSAS CITY
Richards & Conover Steel Div. (A)
NORTH KANSAS CITY
Metal Goods Corp. (AB)
ST. LOUIS
Metal Goods Corp. (AB)
E. E. Souther Iron Co. (A)

NEBRASKA
OMAHA
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BUFFALO
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SYRACUSE
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Edgcomb Steel & Aluminum Corp. (AB)
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Mapes & Sprowl Steel Co. (AB)

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COLUMBUS
Vorys Brothers, Inc. (AB)

OKLAHOMA
TULSA
Metal Goods Corp. (AB)

OREGON
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Electric Steel Foundry Co. (AB)

PENNSYLVANIA
PHILADELPHIA
Edgcomb Steel Co. (AB)
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YORK
Edgcomb Steel Co. (AB)
York Corrugating Co. (A)

RHODE ISLAND
PROVIDENCE
Congdon & Carpenter Co. (AB)

TENNESSEE
MEMPHIS
Metal Goods Corp. (AB)

TEXAS
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FORT WORTH
Maxwell Steel Co. (A)
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WASHINGTON
SEATTLE
Electric Steel Foundry Co. (AB)
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WASHINGTON, D. C.
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American Machinist

MAGAZINE OF METALWORKING PRODUCTION · ESTABLISHED 1877

To Prevent Your Being Overwhelmed

Walter Reuther has proclaimed publicly his intention of trying to get a big-package deal for his auto workers next year.

He will ask for a shorter work-week with no reduction in take-home pay. He is likely to seek a boost in the hourly rate on top of that. What it all adds up to is more pay for less work.

Mr Reuther voices the lofty sentiment of having as his objective an increase in the purchasing power of the consumer, thus helping to strengthen and stabilize the national economy. But he maintains a significant silence about the inflationary aspects of his plan.

His is not a depression measure, mind you, to counteract mass unemployment and spread the work. The proposal is publicized at a time when the economy is riding high and is in a minimum of trouble.

The extra costs involved . . .

do not all appear on the surface. If Mr Reuther should succeed in getting a 36-hour or a 38-hour week, a new low base would be established above which overtime would be paid. That is just one of the extras.

Unless the cumulative experience of recent years can be completely ignored, Mr Reuther is pretty sure to achieve at least part of what he is after. Other unions will try to rival him with even bigger demands. And the general pattern will be set.

One conclusion can be drawn for sure. The cost of labor will continue to go up. Industrial prices will rise too. That means that the price of almost everything that is a part of your product will mount.

The further rise in labor and materials costs is to be lamented. But it cannot be ignored. Whether you like it or not, it will confront you sooner or later. So why sit back and let its effects creep up on you?

You should begin to plan . . .

on dealing with the situation before you actually are faced by it. For one thing, you should look into all phases of your manufacturing operations to find out what up-to-date mechanization can do for you.

If you are going to be forced to pay more to your men for fewer hours at work, then the sensible thing to do is to have them produce more while on the job. The only way in which that can be accomplished is to give them more mechanical help.

The machines they run or supervise must be capable of producing more work faster and better. The work itself must move faster and more smoothly into and out of the machines and from one machine to another.

More than that, your product should be designed so that it can be fabricated and handled economically by automatic devices.

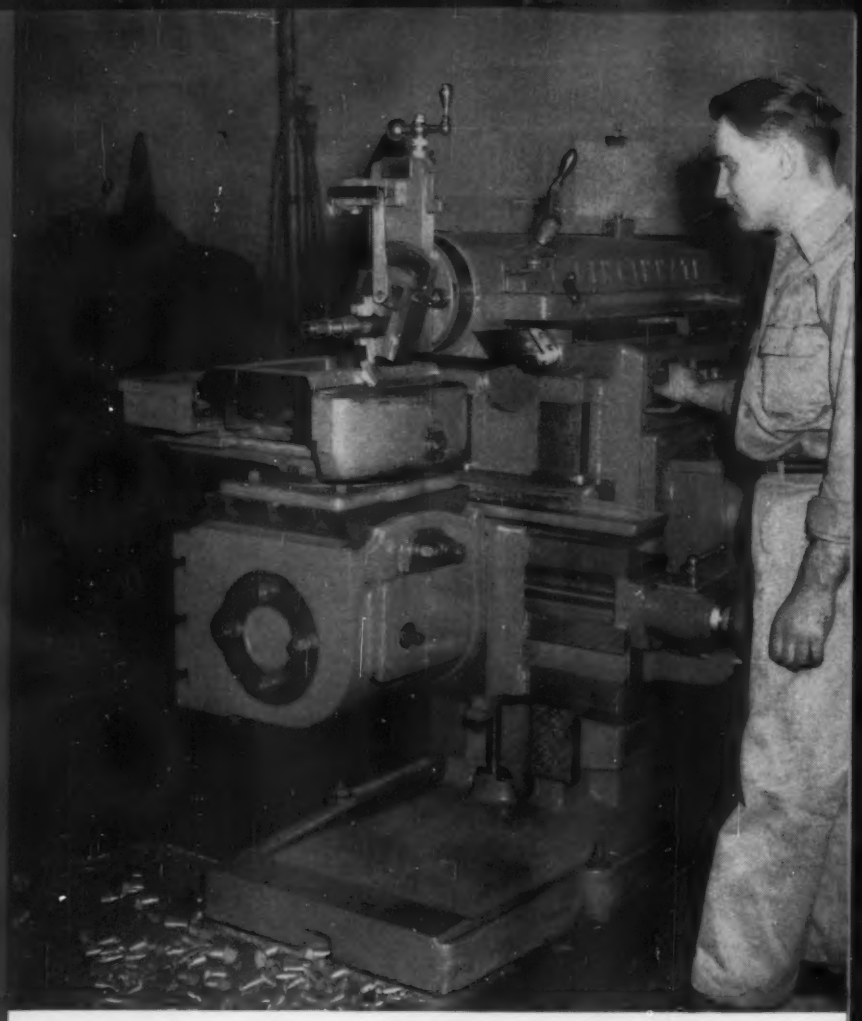
The point is that unless you eventually are to be overwhelmed by rising costs of all kinds at a time when competition is hot and the profit margin may be narrow, you had better do something about it now. One thing that you can do is to make sure that you are getting all the productivity possible out of your men by giving them production equipment of the latest design.

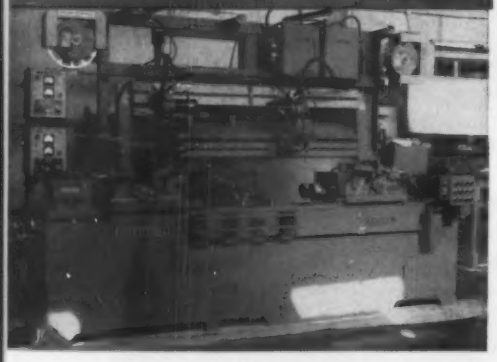
Burnham Finney EDITOR

Accurate heavy cuts by this Cincinnati Rigid Shaper

. . . at NATIONAL ELECTRIC WELDING MACHINES CO.

Bay City, Michigan





The steel slide being machined will be used on a National Automatic MIG arc welder, such as shown above.

Economical production of this steel slide for an automatic arc welder requires heavy cutting with maintained accuracy. The machine chosen for this job is a 16″ Cincinnati Heavy Duty Rigid Shaper. Some of the features which make this performance possible are:

- Extreme rigidity due to heavily ribbed column.
- Exclusive Cincinnati 50 PSI pressure lubrication.
- Maximum accuracy due to extended ram bearing and slot-free ram.
- Fast, easy operation due to electro-magnetic brake and clutch with finger-tip control.

Write **Department A** for Bulletin "CINCINNATI RIGID SHAPERS". We also suggest you consult our Application Engineering Department on your machining problems.

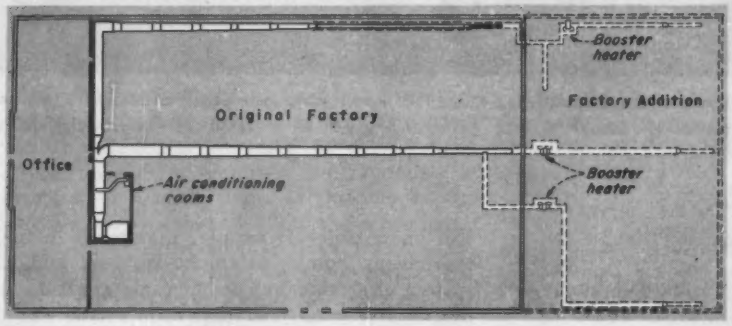
Photo courtesy National Electric Welding Machines Co., Bay City, Michigan.

CINCINNATI

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

Reg. U.S. Pat. Off.



Rotor's plant, built in 1951, has been expanded 46% (from 32,000 to 47,000 sq ft of manufacturing area) by an addition at the rear. Basic arrangement of air-conditioning equipment is diagrammed, plus the addition

Yes, it does pay to air-condition your plant

Four years ago, the Rotor Tool Company built a new plant with low-cost air-conditioning systems for office and factory. Operating cost was figured then at 3¼¢ per hour, per man, for the five summer months. Here's a full report on operation of the present system, together with a description of how the original system has now been expanded to cover a plant addition

H P BAILEY, president
THE ROTOR TOOL COMPANY

In 1952 the Rotor Tool Company moved into a new plant with complete office and factory air conditioning, 32,000 sq ft in manufacturing, 8,000 sq ft in office space. The objective of the air conditioning system (*AM*—Feb 2, 1953) was to provide a clean factory with controlled temperature and humidity. Our study showed that few people understood the necessity for controlling both these conditions, and it appeared that some partial systems in Cleveland were not really satisfactory as compared to full air conditioning. In general, these ventilating systems provide straight ventilation which became hot air when the temperature got about 80 F, and unless provision was made in the way of ducts and fans for handling a tremendous amount of outside air, it was impossible to get inside temperatures equivalent to outside temperatures. Technically speaking, our objective was to maintain 80 F dry bulb, 50% relative humidity inside when the outside air was 95 F dry bulb, 75 F wet bulb.

Our experience with the system during the last four

Turret-lathe and automatic section of the main building shows the cleaner shop, more easily maintained by air conditioning. Another advantage is elimination of difficulties with parts and gages as a result of temperature variations

years bring us to the definite conclusion that *air conditioning your factory does pay.*

We have in Cleveland as many as 30 days during the summer when outside temperature is above 90° F. Meanwhile, operations proceed at a regular pace, the plant is clean, and all difficulties with temperature changes in parts or gages are eliminated.

During the past four years, we have come to the realization that Cleveland, like all cities, has experienced considerable increase in polution of the air, which contains dirt as well as fine particles from the operation of oil refineries, steel plants, coke ovens, etc. Filtering of incoming air through Pliotron filters removes a large part of this. We are now distributing 50,000 cfm, 10,000 coming from the outside, 40,000 from recirculation inside.

In addition, by combining the heating and air-conditioning installation, we have found that the fresh air mixed with recirculated air in the heating system gives advantages that were really not contemplated in 1952.

The previous article explained how the basic load for summer cooling and de-humidifying was figured, how window areas were controlled. Additional insulation (1 in. of Cello-Tex) was put in the roof originally, and Kool-Shade screens used to cut the basic heating and cooling load, which was finally estimated at 115 tons in the factory, 13 tons in the office. We therefore installed the nearest-size compressor, 125 tons in the factory and two package units, totalling 12½ tons, in the office. The original installation, as explained previously, included a number of economizing features, such as feather-valve control on the compressor, economizing control on outside-air supply, maximum temperature thermostat, combined smoke-removal and exhaust system, variable-bypass heating control, and an evaporative condenser that reduces the use of condensing water which is expensive in Cleveland. Later we added cut-out valves to avoid short cycling of the compressor.

While we know that the Pliotron filters work better than the glass-fiber filters, we have learned that these filters ought to be taken out, replaced with a second set, and the dirty filters washed, more often than we would like. It seems that the filtering action of a Pliotron filter is much more effective if it is not allowed to get really dirty. We are now replacing the Pliotron filters with "Airmat" filters, laminated cellulose material, 10 ply. We considered adding an electrostatic charge to this paper filter but did not feel we had enough oil mist to justify the higher cost. This change will add some additional depreciation to our air-conditioning charges but eliminates the temporary shutdown necessary to replace the filters, eliminates labor charges and, we think, will do a still better job.

During the four years, the entire system has operated quite satisfactorily, but we do report one point of minor difficulty. In the fall, we find it necessary to drain the condenser on the roof so that it will not freeze, and sometimes we get a spell of warm weather after the condenser is drained. This means that we do not have cooling capacity in the shop in the afternoon. The flow of cool air during the night, under these conditions, leaves the shop at the right temperature in the morning; but by, say, two o'clock, the sun has warmed up the building and the temper-

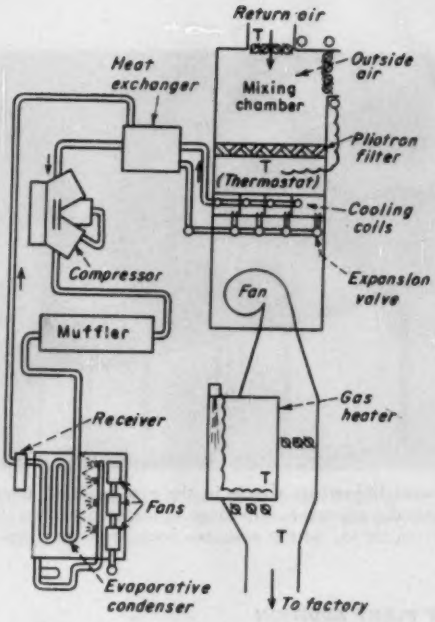
ature rises above the usual 75 F. The same situation may also arise in the spring before we are willing to fill the condenser with water that might freeze. In the office we have a slightly different minor difficulty. Sometimes we find that the hot-water heating brings the temperature to the right point on a fall morning, but the heating system tends to retain its heat and, as the sun comes up, the office gets too warm. In this case the answer is easy—we turn on the package air-conditioning units for fifteen or twenty minutes and get temperatures back to normal.

REVIEW OF OPERATING COSTS

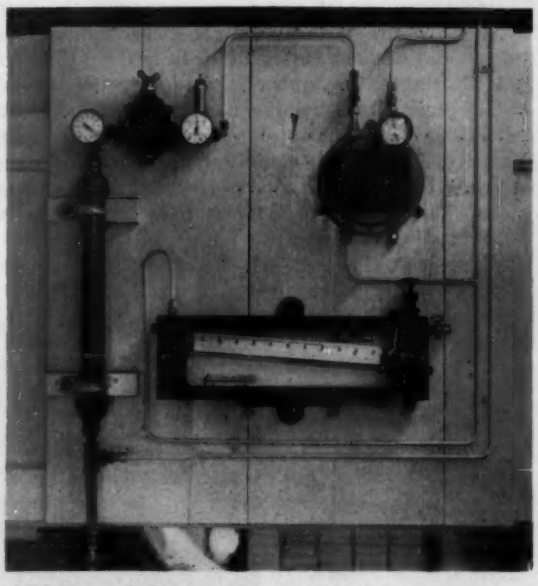
The original article reported the cost for the original installation in 1952 as 93¢ per sq ft in the office, $1.27 in the factory—an over-all average cost of $1.20. Operating costs were figured at 3¼¢ per hour, per employee, for the five summer months. As we review operating costs today, we find them surprisingly close to our original figures. Basic figures for depreciation, of course, are the same. There are some small increases in the cost of filter replacements, maintenance and inspection. Cost of electric power in Cleveland has increased by 8%, and the original cost figured for repairs to the condenser to get it back in first-class shape at the end of the period have gone up about 25%. On the other hand, the hours of employment serviced have increased, so we find that on the basis of the original cost of installation, today's operating cost is 3.18¢ per hour per employee for the entire plant or, practically unchanged.

Incidentally, this cost includes another item which we never thought of in the first place. When we first started operations, some dirt got into the main ducts and the fiber filters which were used perhaps did not filter the dirt out properly. Later we changed to Pliotron filters, which gave a closer screening of the air. However, after four years, with the general pollution in the air, we discovered that there was dirt and oil in the ducts which might constitute a fire hazard. We employed a local concern who sent men up into the ducts, vacuum-cleaned them, put solvent on, and cleaned them out thoroughly. We expect to repeat this operation probably in another four years.

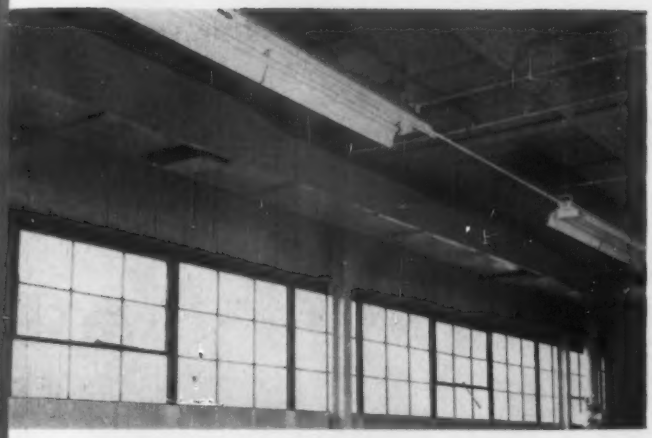
To make this article of greater interest to factory executives under today's conditions, we have asked the Avery Engineering Company to re-estimate the original cost of installation to give us correct figures for today. During four years, equipment items in the installation cost have gone up about 25%, labor items 30 to 40%, sheet metal in Cleveland has gone up about 90%, so that we find that our original total cost of installation, $48,174, today would be $67,780, or a change in the cost of the installation from $1.20 a square foot to $1.67. If we refigure today's actual operating costs, 3.18¢, and add the additional depreciation charges for installation today, the cost would be 3.87¢. We feel this is generally in line with increases in all factory costs.



Air-conditioning system takes return air from plant and fresh air from outside, mixes both, and passes air through filters and cooling coils. In summer, air then is moved directly to ducts for delivery to shop. In winter, thermostat directs part of air through gas-fired furnace, then into shop ducts. Cooling medium is Freon 12. After it leaves cooling coils, Freon is compressed to 125 psi, then is cooled to 105 F in the condenser. Cooling changes the gas to liquid. This in turn is expanded in the cooling coils, where pressure drops to 40 psi and the liquid becomes a gas. This change absorbs heat, cooling the air passing over the coils. Cycle then repeats



Addition of this manometer 3½ years ago in the shop center solved a problem with variations in exhaust air from buffing and heat-treat. It adjust air intake to match exhaust automatically by measuring pressure through a copper line running to various points in the shop. Inside pressures formerly varied from –3 oz to +3 oz, allowing gas fumes from the furnace to spread



Air-conditioning ducts in the new addition are tapered to improve air flow to openings which are individually adjustable. Openings in the original duct (left in right-hand photo) were reduced in size to carry the air on. In this case, two branches were added to the duct

NEW PLANT ADDITION

In 1956 we built an addition at the rear of the plant, 15,000 sq ft, which increased the factory space serviced by air conditioning from 32,000 to 47,000 sq ft—an increase of 46%. Following our successful experience, we decided to air condition the new addition. We realized that the original figures estimating load on the main plant were high, and our previous article reported that the original installation had some extra capacity for future expansion. We therefore figured the load on the new addition, taking advantage of our experience with the load factors, and the system was extended into the addition at the back by doing these things:

1. Cutting off the ends of the ducts in the far end of the plant, replacing them with larger ducts and extending them out into the new plant (photos). Velocity of the air, of course, was stepped up in the air-conditioning room.
2. Adding two new condenser coils in the plenum.
3. Changing pulley ratios on the compressor and blower to distribute more air.
4. Inserting booster heaters in the air duct for heating purposes (photo).

Booster units were necessary because, while the original factory furnace is quite adequate for the original building, it would not carry the overload necessary for the new addition. The units give us the same advantage of heated fresh air without drafts as we enjoy in the main plant and we were a bit surprised to find that addition of these units cost only $3525, compared to an estimate of $5227 for separate unit heaters, supplied with gas lines, electric lines, etc, throughout the addition. We were also a bit surprised to find that the total cost of the air-conditioning installation for the new plant was only $9320, or 62¢ per sq ft, a surprisingly low figure, although it must be remembered again that our original installation was undoubtedly oversized.

During the past four years, we have had a good many inquiries regarding our air conditioning, with

The new addition served by the old air-conditioning system by changes enumerated above

some skepticism expressed about our low cost. Of course, it must be remembered that the installation was put in in 1952 (ordered in 1951). Moreover, our engineers tell us that our costs per square foot can never be duplicated when installing air-conditioning systems in older buildings, particularly those with high ceilings. They also tell us that in the case of smaller floor areas than ours, centrally located air-conditioning systems in new buildings will probably cost somewhat less. Our engineers emphasize that recent developments in package air conditioners make possible installations for short run of ducts on an efficient basis. Package conditioners today of the industrial type are heavily made and installations of package conditioners since 1949 do not show signs of rusting out, although it must be expected that condensers will have to be replaced ultimately, the same as in stationary-compressor installations. They also point out, as have a number of visitors who have examined our costs and systems, that arrangements for giving individual controls of air conditioning in individual rooms are certain to be very expensive.

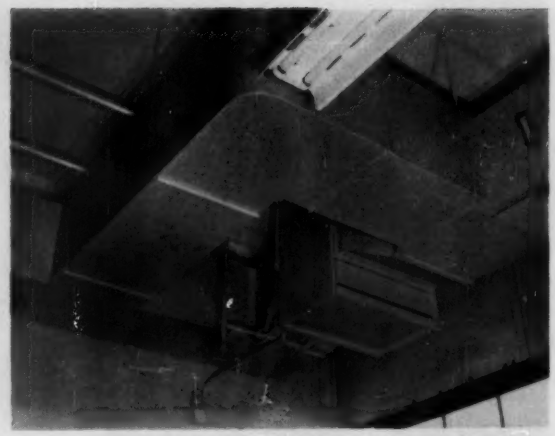
Here, at Rotor, we have two temperature controls at the two ends of the office, one main temperature control in the factory. Individual controls require both heating and cooling systems extended throughout the building, and attempts to have the president's office at 68 F and the private secretary's office at 77F, while it can be done, can be accomplished only by rather excessive costs. Our engineers also point out that we have installed our air conditioning system ourselves, contracting with Avery Engineering Co, which designs and installs and tests the system. In this way we avoid the fees of architects and the extra profit margins of contractors who, in general, don't like to be responsible for installing air-conditioning systems as a part of the basic building contract. These points are mentioned on the basis of various inquiries made to us by other people considering air-conditioning and heating systems.

As a result of our experience, maintaining a uniform 75F all over office and plant, we are inclined to disregard the oft-told cliche that the inside temperature should be kept always 10 or 12 F below the outside temperatures so that, in leaving the building, employees are not struck by the wide difference in temperature. In practice, this does not happen, and while we have an occasional worker who would like to have it hotter or cooler than it is, these occasional situations are by no means troublesome.

REVISED COSTS FOR 1957 AIR CONDITIONING FACTORY AND OFFICE

Because today's figures are of prime interest to readers, we have taken the previous figure of 3.87¢ per hour for operation of the present system at present installation costs and added the operating cost of the new addition.

The over-all figure for the entire plant is now 3.4¢ per hour, per employee, for the five summer months. While it is not possible to measure accurately the savings in operating costs from the so-called economizing feature, we feel that they are not particularly excessive in comparison with savings, and certainly do reduce operating costs considerably. Moreover, the figures do not express the advantage we have of a lower heating cost as well as the basic operating cost for air conditioning.



Booster heaters in the air duct handle heating by passing some air into the unit under automatic damper control. For cooling, air bypasses the booster heater

RESULTS

We have been asked many times how much production has increased through the use of air conditioning. We cannot give a positive answer. Our plant never shuts down in the hot summer months, production proceeds regularly throughout the day, the plant is clean and at the time we started up the system in the new plant, we knew that efficiency was improved. However, during the four years before and after air conditioning our products have changed, our equipment has changed. (See article "Small-Lot Production on High-Production Machine Tools," *AM*, Jan 14 '57). There has also been some drop in the availability of trained and skilled operators, and our products mix has changed radically as we added new products.

The factory organization is quite certain that the cost of air conditioning on the basis of 3.4¢ per hour, compared with production cost of $2.25 per hour for labor, plus fringe benefits of perhaps 30¢ and on top of this, factory overhead of at least $2.00, a total of $4.55 per hour, leaves us with no hesitation in recommending air conditioning for metalworking plants. Of course, the installation must be planned correctly, the cost of installation controlled, and the system not allowed to get over-fancy with a multitude of individual temperature controls.

We are quite sure that our original estimates of 3 to 5% increases in production are still valid. Air conditioning of all office and factory operations is a fixed policy today at the Rotor Tool Company on the basis of the results of the last four years.

Machined CI PowerFlite transmission cases . . .
are deburred inside and out in this two-man-operated Shelblaster, with machine cycle averaging 30 to 45 sec. They are unloaded onto shaker table for cleaning prior to delivery by conveyor to nearby inspectors

Deburring improved, cost reduced by...

Blasting with crushed walnut

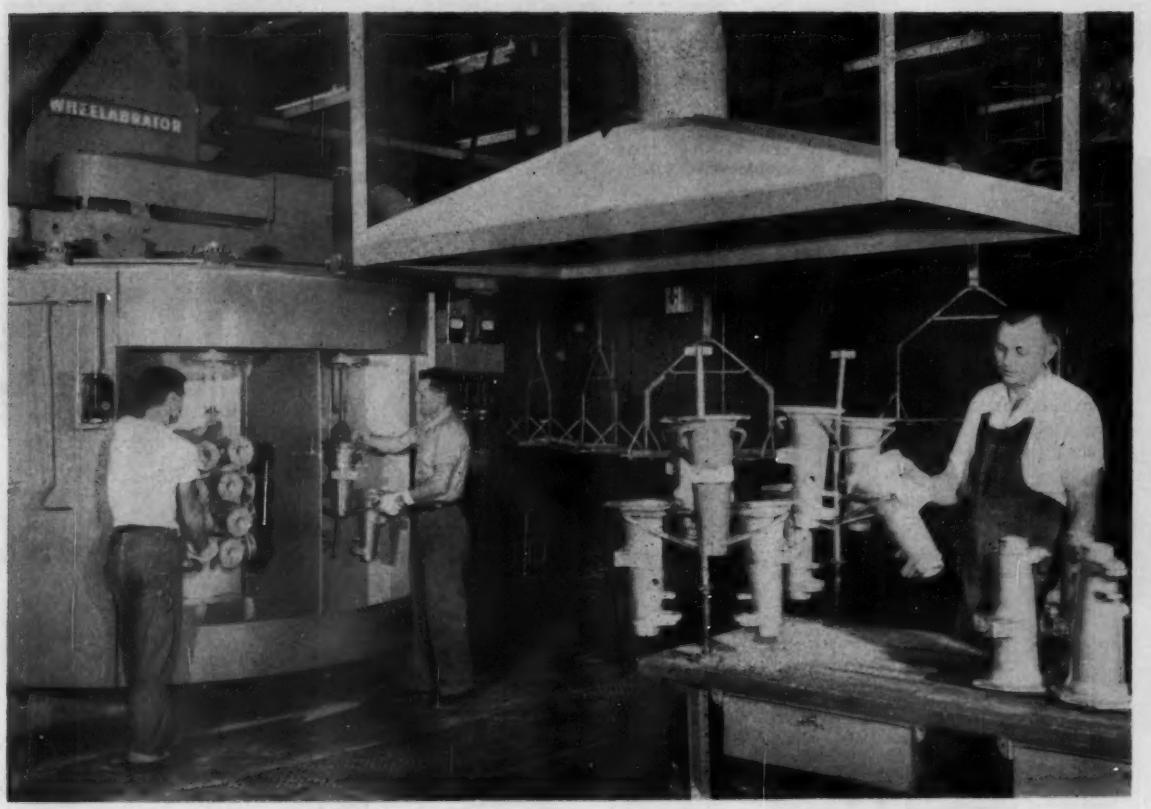
Automatic deburring proves effective on a variety of parts of different materials. Operations include both shell blasting and shot blasting

As told to BEN C BROSHEER, associate editor
by WILLIAM D STAMPFLI, staff specialist
and W REECE BAUGHN, tool research
Power Flite Transmission Plant
CHRYSLER CORPORATION, INDIANAPOLIS

Blasting with crushed walnut shell pellets has replaced manual operations for cleaning and deburring many of the parts in Chrysler PowerFlite automatic transmissions. It is also being substituted for barrel tumbling in some instances. The process is proving to be more thorough—does not miss surfaces as manual deburring often does—and it has helped reduce costs.

Two Wheelabrator mechanical Shelblasting units have been installed at the Indianapolis plant for deburring operations—one for cleaning and finishing CI transmission cases, the other for deburring machined CI, steel, and diecast aluminum parts.

Mechanical blasting was selected in preference to previously tested pneumatic blasting, because it does not require a supply of compressed air, and because it provides much greater velocities and vol-



Small machined parts are deburred . . .
with crushed shell pellets in this unit. Parts are loaded onto special hangers at nearby workbenches, then moved into compartments which are indexed past two blasting wheels in automatic 22.5-sec cycle. After deburring, parts are placed on conveyor at rear for removal to assembly area

shell pellets

ume. Crushed shell pellets were used in testing both types of unit.

OPERATIONS

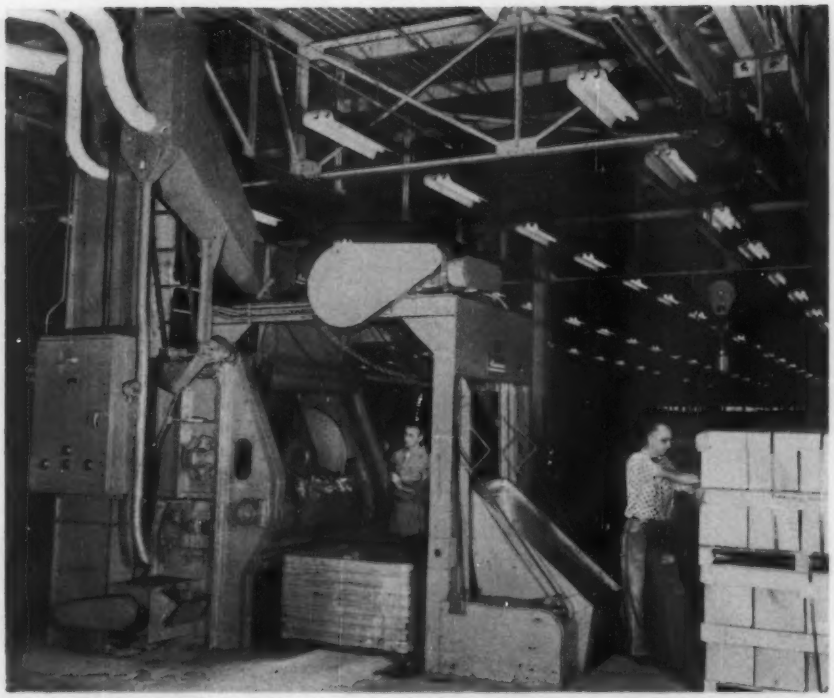
When shell blasting is used to clean and deburr machined parts, it is essential that the parts be washed and dried thoroughly before blasting. Dust caused by breakdown of the shell pellets during the blasting operation will adhere to surfaces even slightly damp—especially in small cavities and blind and tapped holes. After blasting, it is a good practice to blow out such holes with air nozzles to insure thorough cleaning.

Pellets prepared by crushing and screening English walnut shells have proven most satisfactory for the cleaning and deburring operations at the Indianapolis plant.

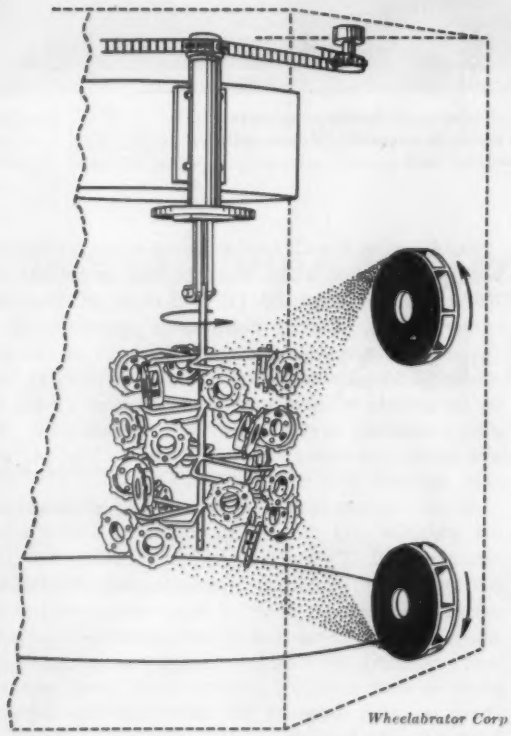
For blasting the CI transmission cases, pellets that will pass through a No. 6 screen and be caught on a No. 10 screen are used (U S Bureau of Standards screen sizes). During continuous operation of the case-cleaning machine, five 80-lb bags of the 6/10 screen pellets are added for every 2500 cases to make up for pellets broken down and removed by the two dust-collecting systems serving the machine. This averages approximately 0.16 lb of pellets for each case cleaned and deburred.

In the second machine, where the smaller parts are cleaned and deburred, pellets of 10/12 screen size are used. This machine deburrs some 900 parts per hour and consumes approximately 0.035 lb of pellets per part. A crew of three men operates this machine, loading parts onto wire hangers at adjacent work benches, moving the hangers to rotatable supports in each machine compartment, then removing them to other benches for unloading the deburred parts to wire baskets.

Hanger loads vary with size of part. At the case-deburring machine, three parts are mounted on each carrier. Typical loads at the other machine are: pinion carriers, 20 per hanger; case extensions, which are 14 in. long and weigh 5 lb each, 4 per hanger;



Tumblast unit cleans and stress relieves . . . incoming CI and diecast of aluminum parts, as well as many machined and hardened steel parts, with a blasting medium of chilled cast steel shot. Two-man crew puts more than 3000 lb of parts through this machine each hour



Wheelabrator Corp

Streams of crushed shell pellets at 250 fps . . . insure coverage of all part surfaces as the hanger loads are automatically rotated in the blast zones. Machine cycle time is adjustable, permitting longer processing for more complex parts. The two blast wheels normally operate in separate compartments, but are shown here together for simplicity

valve bodies, 30 per hanger; outboard shaft supports, 12 per hanger.

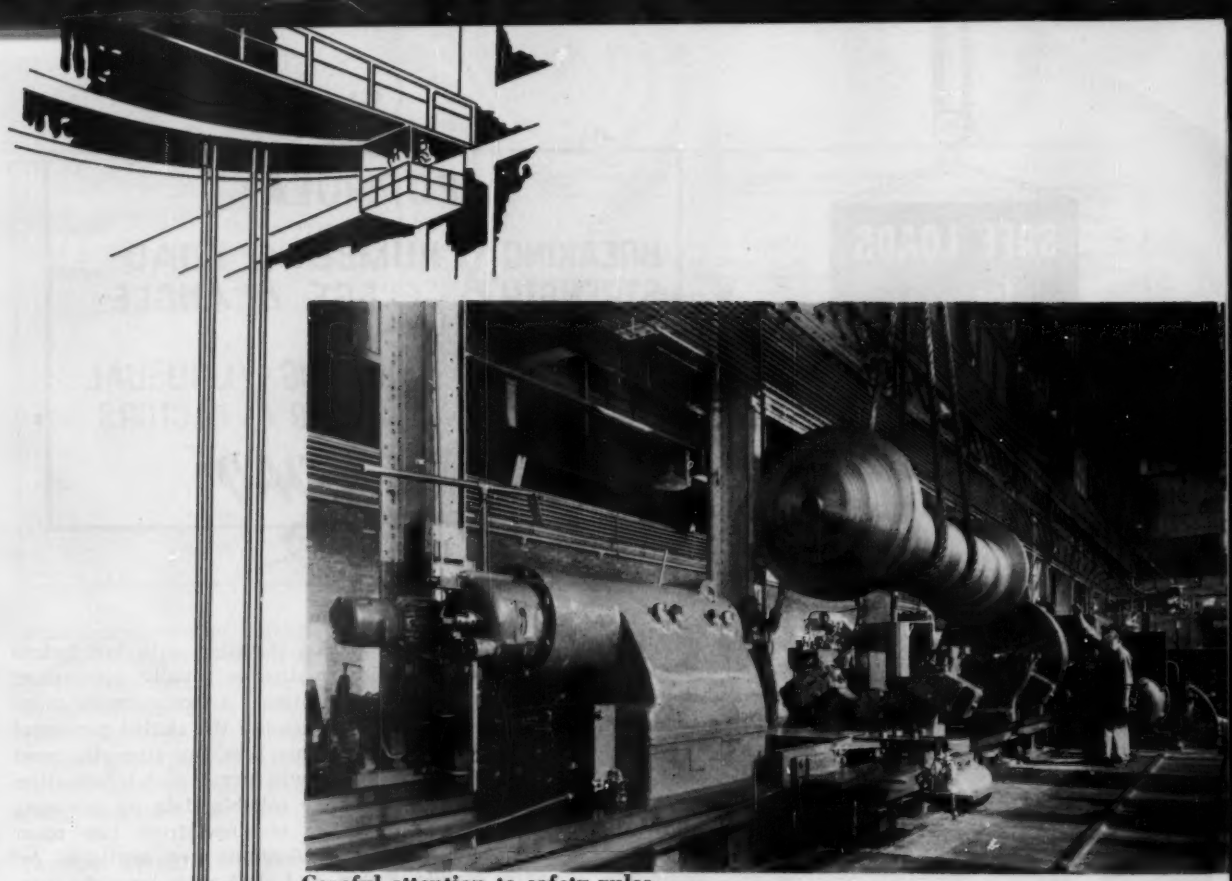
Dust collected as the crushed-shell pellets break down makes possible an additional saving. It is used in place of commercial sweeping compounds for cleaning shop areas where oil may have been splashed or spilled on the floor.

Some thought has been given to transfer of the pellets from the case-deburring machine to the second machine when they have broken down to the 10/12 screen size needed for deburring smaller parts. But this is not desirable at present, because pellets used on the cases carry with them considerable CI dust which would have to be removed before blasting the pellets against aluminum parts. Consideration is being given to the employment of some cleaning device, such as a magnetic separator.

ADDITIONAL SAVINGS . . .

are being realized by Tumblast cleaning rough diecast aluminum alloy parts with steel shot prior to machining. This removes casting flash and, therefore, minimizes or eliminates hand cleaning by machine operators to insure a good fit of the parts in holding jigs and fixtures. It also relieves locked-in stresses in the chilled skin surfaces of castings, greatly reducing the possibility of distortion in subsequent machining operations. Life of cutting tools used to machine these parts also is increased.

For cleaning CI, steel, and diecast aluminum parts in this unit, the blasting mixture consists of five parts No. 110 and one part No. 170 chilled round cast-steel shot. A crew of two men cleans approximately 26,000 parts in each 8-hr shift.



Careful attention to safety rules . . . is essential when heavy parts are moved through the shop with cranes and hoists. Here a rough-turned 58,000-lb shaft for a hydraulic turbine is being lifted into a 72-in. lathe for finishing. To make certain that every element of the hitch is strong enough to do the job, safe-load tables can be devised to provide the margin of safety required

SAFE LOADS for CRANE LIFTS

Cranes and hoists are employed throughout the metalworking industry to move loads through the air. Unless every factor affecting a lifting operation is solved correctly, shop personnel may be endangered. Safe and efficient crane operation and hitching require know-how, exercise of good judgment, and constant application of carefully developed safety rules and practices. Here is how one company determines what loads its hitching equipment can handle

M F BIANCARDI, Manager, Safety Services, ALLIS-CHALMERS MFG CO

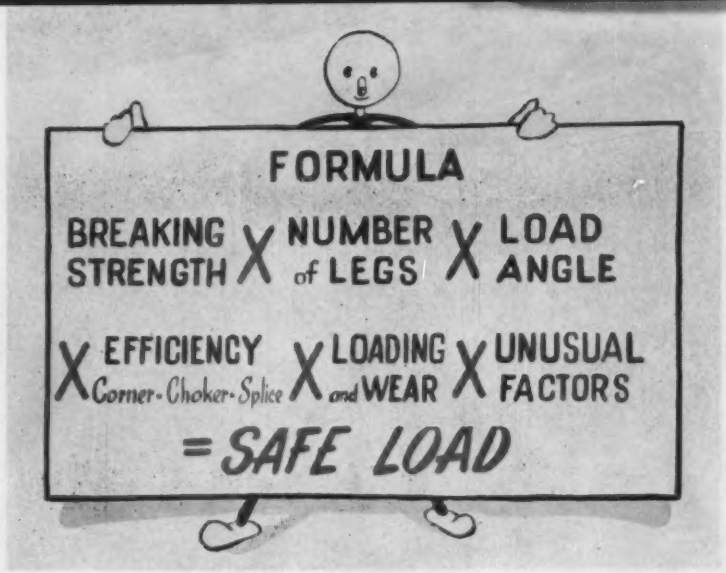
Men who move materials with cranes and hoists need to determine scientifically the *safe-load* capacity of lifting equipment and accessories. They must also take steps to insure that, through frequent inspection and preventive maintenance, the lifting efficiency of this equipment is maintained.

A safe load can be defined as *the maximum load that equipment can lift in a given application, within limits set for the reasonable safety of the people below and the material being handled.*

Safe-load tables, properly designed and clearly understandable, can be an important contribution of the safety engineer to the prevention of accidents. Unfortunately, maximum safe-load data for many lifting arrangements are not available. Makers of hoisting equipment often list safe-load data in their catalogs, but usually this information consists of overly simplified tables for a few applications. While this information is helpful to a degree, it is not applicable to many lifting conditions in actual practice. Safe-load tables should list *all* possible hoisting conditions.

SAFE-LOAD FORMULA

At Allis-Chalmers we have simplified the preparation of comprehensive safe-load tables by developing a formula in which the breaking strength of the hitching equipment is multiplied by a series


FORMULA
BREAKING STRENGTH X NUMBER of LEGS X LOAD ANGLE
X EFFICIENCY Corner-Choker-Splice X LOADING and WEAR X UNUSUAL FACTORS
= SAFE LOAD

Safe-load formula . . .
developed by the Safety Services Section at Allis-Chalmers helps insure the safe operation of cranes and hoists. The formula considers every important factor in the determination of practical safe-load limits for any given combination of lifting conditions

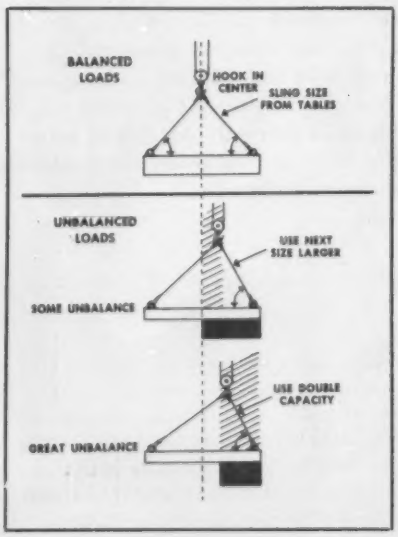
of factors applicable to specific hoisting problems. For ease of calculation, these factors are stated in terms of percentage of unit strength, and include a reasonable *safety gap* between working load and breaking load.

Each hoisting problem involves different conditions: the number of sling legs (branches) may vary; crane headroom may dictate a certain load angle; the corners of the work may be sharp; the sling may be worn; the crane controls may cause the load to be raised with some shock; and the work itself may be hot or cold. All these factors determine what size sling should be selected to provide a safe lift.

The basis of our safe-load formula is the breaking strength of the sling itself, the maximum strain that can be imposed on the sling until just before it breaks. This information is usually determined under laboratory conditions; although most shops have neither the facilities nor the skilled personnel needed to determine this breaking strength, most manufacturers of slings will furnish such information.

We have found that reliable data on breaking strengths can also be obtained from two other sources. Federal Specifications are available for wire; manila, Nylon, and sisal rope; wrought iron; alloy-steel chain; and many other hitching materials and accessories. Another excellent source is the American Society for Testing Materials, which recently has begun to publish testing specifications for lifting materials.

Occasionally one encounters hitching material for



When hitching to an unbalanced load . . .
hitcher should (1) locate the center of gravity of load, (2) place crane hook above that point, (3) rig the sling from load to hook, so that the load will not tilt when lifted

TABLE I: Breaking Strength of Hitching Media

Nominal Size	Alloy-Steel Chain		Manila Rope (3 Strand)	Braided Wire Rope Slings: Wire Rope (6 x 19 IPS-FC)*	Braided Wire Rope Slings: (6 x 19 IPS-FC)*	Shackle, Anchor or Screw Pin
Inches	(Note 1)	(Note 2)	(Note 3)	(Note 4)	(Note 5)	(Note 6)
	Minimum Tons	Minimum Tons	Minimum Tons	Nominal Tons	Nominal Tons	Minimum Tons
¼	5.5	5	—	2.59	15.33	1.77
½	18	16.25	1.325	10.2	59.9	7.075
¾	38.5	34.75	2.7	22.6	133.2	15.9
1	67.5	61	4.5	39.8	234	28.275
1½	134	122	9.25	87.9	—	59.35
2	—	—	15.5	154	—	105.5
4	—	—	52.5	—	—	—

* Improved Plow Steel, Fiber Center
Breaking strength is the nominal or minimum guaranteed breaking strength of the hitching medium. Values listed are those used by Allis-Chalmers to develop safe-load tables.
Note 1: Federal Specification No. RR-C-271a, Sep 21 '56
Note 2: ASTM Tentative Specification No. A391-55T, Jun '55
Note 3: Federal Specification No. T-R-601a, Nov 26 '35
Note 4: Federal Specification No. RR-R-571a, May 8 '45
Note 5: Wire Rope Engineering Committee, 70% of Federal Specification for 8-wire ropes, 1955
Note 6: Federal Specification No. RR-C-271a, Sep 21 '55

TABLE II: Load-Angle Efficiency

Load Angle (Degrees)	Trigonometric Function (Sine of Angle)	Lifting Efficiency (Per Cent)
90	1.0000	100.00
75	0.9659	96.59
60	0.8660	86.60
45	0.7071	70.71
30	0.5000	50.00
15	0.2588	25.88
0	0.0000	0.00

TABLE III: Splice, Choker, and Corner Factors

Nominal Size	Alloy-Steel Chain		Manila Rope (3 Strand)		Wire Rope (6 x 37 IPS-FC)			Braided Wire Rope Slings (6 x 19 IPS-FC) 8 Parts	
Inches	Choker %	Corner %	Splice or Choker %	Choker %	Splice* %	Choker %	Corner %	Splice %	Choker %
¼	80	80	80	64	93	68	68	100	75
½	80	80	80	64	90	66	67	100	75
¾	80	80	80	64	87	63	67	100	75
1	80	80	80	64	83	58	65	100	75
1½	80	80	80	64	75	52	57	—	—
2	80	80	80	64	67	50	50	—	—
4	80	80	80	64	—	—	—	—	—

* These values are for eye splices, without thimbles, in wire-rope slings of the size shown.

which standard specifications cannot be obtained or for which breaking-strength data cannot be supplied by the manufacturer. In such cases, a plant can go to its own laboratory or to a commercial laboratory that specializes in custom testing of materials. Typical breaking strengths for hitching media commonly used by Allis-Chalmers and many other plants are listed in Table I.

FACTORS AFFECTING BREAKING STRENGTH

The breaking strength of hitching material can be modified by such factors as (1) the number of sling legs connecting the crane hook with the load; (2) the angle between the load's horizontal surface and the sling leg; (3) the *weak-link* efficiency of weakening elements like splices, knots, choker hitches, and sharp corners; (4) the effect of shock loading and acceleration; (5) the normal wear and tear the equipment will receive before it is finally discarded; and (6) the effect of unusual conditions on the material's tensile strength, such as high or low temperatures, fatigue, susceptibility to brittleness, corrosive or solvent atmospheres, and excessive vibration.

All these factors are multiplied together, as indicated in the formula, to determine a rating for a sling or other hitching device that will be safe, predictable, and easily maintained for a reasonably long life.

Number of Legs: The greater the number of sling branches or legs used to connect the crane hook with the load, the smaller in size are the slings required to distribute the weight among the legs. For balanced loads, that is, loads that are supported by all legs equally, the factor for the number of legs is determined by counting the number of sling branches connecting the load and the hook. This value is multiplied by 100 to determine the lifting efficiency of this factor. A 4-leg sling has a factor of 400% in the formula.

For unbalanced loads (see sketch), where the center of gravity is not in the geometric center of the load, the problem becomes somewhat involved. Here the sling legs on the heavy side will carry a greater percentage of the weight, and simply counting the number of sling legs will not give the number-of-legs factor. Because it is impossible to develop tables to cover unbalanced loads, procedures outlined in the accompanying sketch should be followed.

Where loads are only slightly unbalanced, the sling size is determined by using the next larger size specified in safe-load tables for balanced loads. But where there is considerable unbalance, the sling capacity specified in the tables should be at least doubled.

Load Angle: This factor is a percentage value equal to 100 times the *sine* of the angle measured in a vertical plane between the sling leg and a horizontal surface on the load. The load-angle factor is the one most frequently mentioned in makers' catalogs and has an important bearing on the efficiency of a hitch. But, as will be pointed out, other factors often affect sling strength to a greater degree.

Some makers of ropes and slings still refer in their catalogs to the *sling angle,* the angle between the sling legs measured at the crane hook. However, the sling angle, being high above the load, is not generally accessible for measurement and its use is dying out.

Weak-Link Efficiencies: Such hitching elements as splices, knots, choker hitches, and corners on loads can materially reduce the working strength of a sling. These factors may be termed weak-link efficiencies, because they usually are in series with each other like the links of a chain. Whichever gives the greatest reduction in strength is the weak link, and determines the efficiency of this factor in the formula. It should be noted that the efficiency values in Table III vary for different types and sizes of hitching materials.

In the table of splice, choker and corner factors, choose the smallest (i.e., the least efficient) of the three to put into the formula. When this table is used, it should be kept in mind that these factors refer to reductions in strength of equipment due to eye or endless splices, choker hitches, and bends of sling legs around "reasonable" corners.

The corner efficiencies listed are for fairly sharp

radii, but not for the razor-sharp corners found on some machined materials or on parts from which die flash and punchpress burrs have not been removed. Wherever possible, slings passing over corners should be protected with lagging, bagging, corner irons, or woodblocks that increase corner radii and prevent damage to the slings.

Knots in manila rope greatly reduce its strength and should be avoided. If they are necessary, safe-load table values should be reduced by 50% or more. Knots permanently damage wire-rope slings and should not be used. Bending the eye sections of braided slings is bad practice, for the seizing wire may break and in some cases splices will be damaged. Shackles should be used when choker hitches are made with wire rope or braided-wire rope slings. Knots or bolts should not be used in chain slings.

Loading Factor: Loading can be divided into *shock* and *acceleration* for descriptive purposes, but in practice these elements tend to blend into one effect on the sling. In shock loading, it can be proved mathematically that the instant the weight of a load is transferred from supporting blocks to a sling, there is a force in the sling that is double the load's weight. In other words, there is a momentary shock-loading factor of 50%, no matter how carefully the craneman operates his controls. In actual practice, however, there is some elasticity in the sling and in the crane hoisting cables that tends to minimize the shock and increase the shock efficiency to more than 50%. How much this elasticity relieves the shock load is difficult to determine, so the 50% value is generally accepted as the shock-loading factor.

Acceleration loading is an additional force on the sling due to the speed at which the crane accelerates the load from rest to hoisting speed. If acceleration is rapid, strain in the sling and hoisting cables can become very large—and the acceleration-loading factor may reach a low value, ranging from 50% to as low as 20% — until the load reaches normal hoisting speed.

Wear Factor: Inspection standards allow for a predetermined amount of wear in lifting equipment. Because this wear reduces the strength of the elements making up a hitch, a wear factor must be added. For our formula, we have combined loading and wear into one factor, which is established at 20%. (This value sometimes is erroneously called a safety factor, implying that it is unused reserve strength. Such is not the case.)

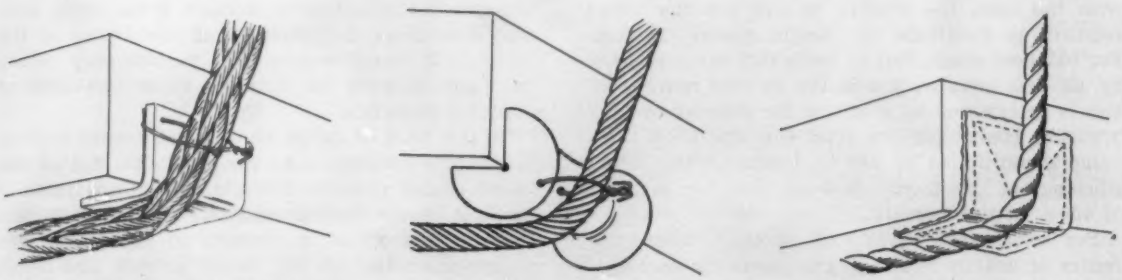
Unusual Conditions: Special operating conditions can affect the strength of a hitch adversely. Four are listed below to indicate the types of conditions that must be considered here.

The first of these is *exposure to high temperatures.* Manila ropes, wire ropes with fiber centers, and other hitching members contain organic matter easily damaged by heat. We recommend 212F, the boiling point of water, as the upper heat limit for fibrous lifting material. A crude but effective way to determine whether this temperature has been reached is to throw a little water on the ropes or load. If it sizzles, a hitching material of greater heat resistance should be used.

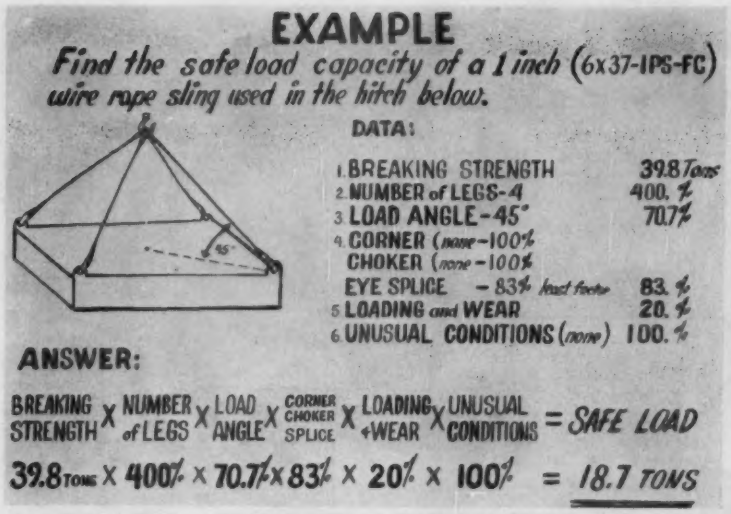
Independent cables with wire-rope cores can be used at temperatures up to about 400F. Alloy chain slings, which are more rugged and flexible but less shock-resistant than wire rope, manila rope, or braided slings, can be used without reduction of safe-load characteristics up to about 500F. Table IV shows the percent reductions in safe loads for such chains used at temperatures between 500 and 800F.

Above 800F (where red heat is visible in the dark) there is a permanent reduction in strength when the chain cools to room temperature, and it should be returned to the manufacturer for reprocessing. When alloy-steel chain must be employed to lift a load heated above 500F, the final factor in the formula should be the percent reduction shown in Table IV.

Low temperatures must also be considered. Here



Slings must be protected . . .
from sharp corners with lagging, bagging, corner irons, or wood blocks, if their useful life is not to be shortened. Machined surfaces will also be protected by these devices


EXAMPLE
Find the safe load capacity of a 1 inch (6x37-IPS-FC) wire rope sling used in the hitch below.
DATA:
1. BREAKING STRENGTH 39.8 Tons
2. NUMBER of LEGS-4 400. %
3. LOAD ANGLE-45° 70.7%
4. CORNER (none-100%
CHOKER (none-100%
EYE SPLICE -83% least factor 83. %
5. LOADING and WEAR 20. %
6. UNUSUAL CONDITIONS (none) 100. %
45°
ANSWER:
BREAKING STRENGTH X NUMBER of LEGS X LOAD ANGLE X CORNER CHOKER SPLICE X LOADING +WEAR X UNUSUAL CONDITIONS = SAFE LOAD
39.8 Tons X 400% X 70.7% X 83% X 20% X 100% = 18.7 TONS

Calculations for a hitching problem . . .
are shown here. When safe-load tables are developed for various hitching materials and existing shop conditions, all practical combinations must be considered

TABLE IV:
Effect of Temperature in Strength of Alloy Chain

Maximum Temperature (Degrees F)	Reduction of Safe Load (Per Cent)
Below O F	50
500 F	None
600 F	10
700 F	20
800 F	30
Above 800 F	70

Above 800 F, alloy-steel chain suffers a permanent reduction in tensile strength, unless reprocessed by manufacturer.

heavy lifting equipment (of more than 1-in. cross section) is susceptible to brittle failure, so that instead of bending or necking down, it fails in a brittle, sudden manner with practically no distortion. Material of this thickness generally is confined to end attachments, such as chain hooks and master rings.

Not much is known about proper precautions to be taken against brittle failure. We have made it a standing rule that, when large-cross-section lifting equipment is used at below-zero temperatures, the safe-load capacity of the hitch is to be reduced about 50%.

Fatigue becomes a consideration when the lifting unit has been used through more than 500,000 cycles. But slings rarely are used this often, and it is seldom necessary to insert a fatigue factor in the formula.

Corrosion is another matter. Manila rope must be protected against weather, solvents, oils, and greases. Wire-rope slings and braided slings need protection against weather, high temperatures, solvents, and chemicals; alloy chain slings should be protected against chemicals, rust, and corrosion. A corrosion factor should be used in plating rooms and other areas where there is a corrosive atmosphere that tends to eat away the sling material. Corrosion is not always apparent on the surface, and the factor to be applied must be based on practical experience until more data are available.

APPLYING THE FORMULA

As an example of how the formula can be applied, refer to the accompanying chart and the tables. Here the problem is to find the safe load for a 1-in. (6 x 37 IPS-FC) wire-rope sling with four branches, each of which has a load angle of 45°. The rope is composed of a fiber center, around which are wrapped 6 strands of 37 wires each. The minimum breaking strength for this wire rope, as listed in the Federal Specifications, is 39.8 tons (Table I).

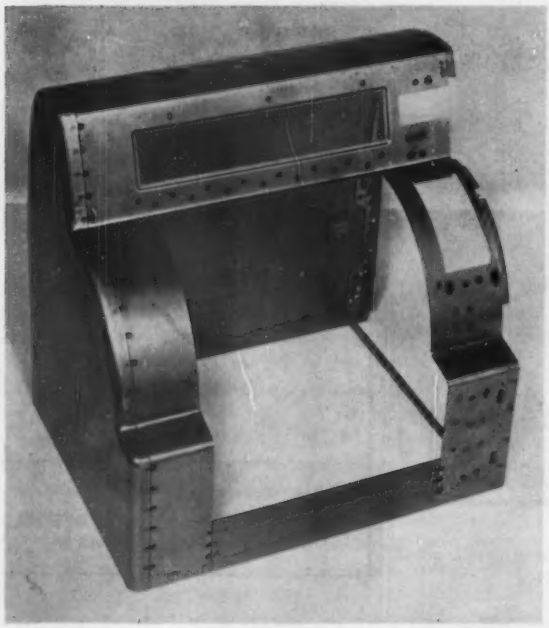
If each of the four wire ropes can withstand 39.8 tons, the hitch has four times that breaking strength, and the factor for the number of legs is 400%. For the true load angle of 45°, Table II provides a factor of 70.7%.

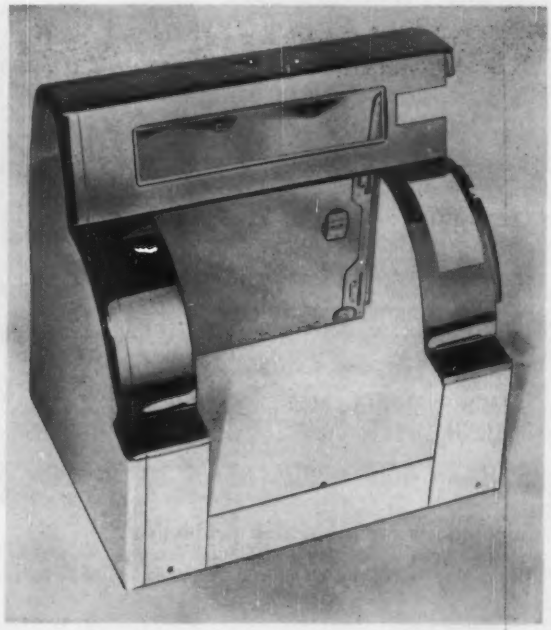
Eye splices are at both ends of the sling, but there are no chokers or corners. To determine the efficiency or weak-link factor, we find from the table that the efficiency of a hand-made eye splice for a 1-in. wire rope is 83% (Table III). Next, for the loading and wear factor, we use the standard factor of 20%.

Changing the above percentages into decimals and arranging them in the formula, we have the following: 39.8 (tons breaking strength) x 4.0 (number of legs) x 0.707 (load angle) x 0.83 (eye-splice efficiency) x 0.20 (loading and wear) x 1.0 (unusual factors), giving a total of 18.7 tons safe load. We have dropped considerably from the original breaking strength to determine a maximum *safe* load, but each of the factors used has a good reason behind it.

By using the formula, we know that we have adequate strength in our safe-load rating to do the specified job efficiently, and with safety to the people below, the equipment, and the load. The typical safe-load charts that are reproduced here are from the Allis-Chalmers *Crane Operation and Hitching Manual*, and show how the results of this method can be made available to the shop for everyday use.

Additional safe-load tables are reproduced as Reference Book Sheets on p163ff.





Cash register cabinet assembled and spot welded (left), and finished with a jewelry-finish chrome plate (right). Two abrasive belts do the job formerly requiring 12 setup wheels

Abrasive belts slash finishing costs

Fewer operations, more production, fewer men, and better quality are obtained by changing from setup wheels to coated abrasive belts at National Cash Register

Switching to coated-abrasive belts for some 300 polishing jobs has enabled National Cash Register Co to reduce over-all polishing costs by as much as 30%. On one job alone, 12 finishing operations were cut to two, production was sharply increased, and final finish met extremely rigid specifications.

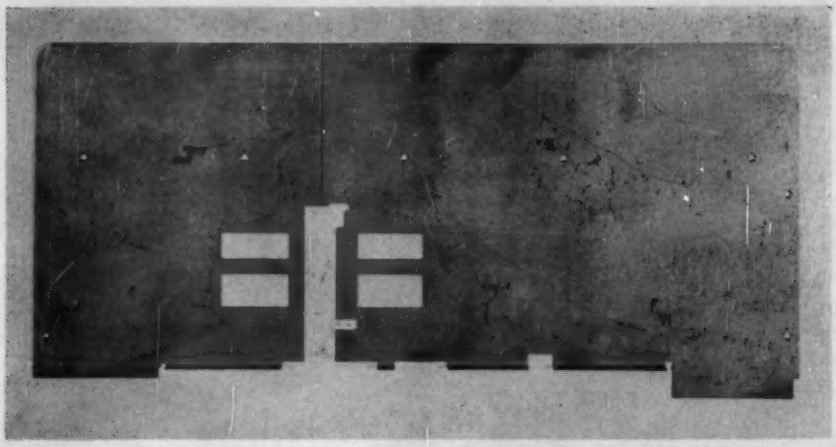
Before making the change, methods engineers studied the possibilities of obtaining higher quality and lower costs and, in cooperation with Minnesota Mining and Mfg Co, conducted a series of tests to develop the best combination of belts, lubricants, and equipment to produce the results desired.

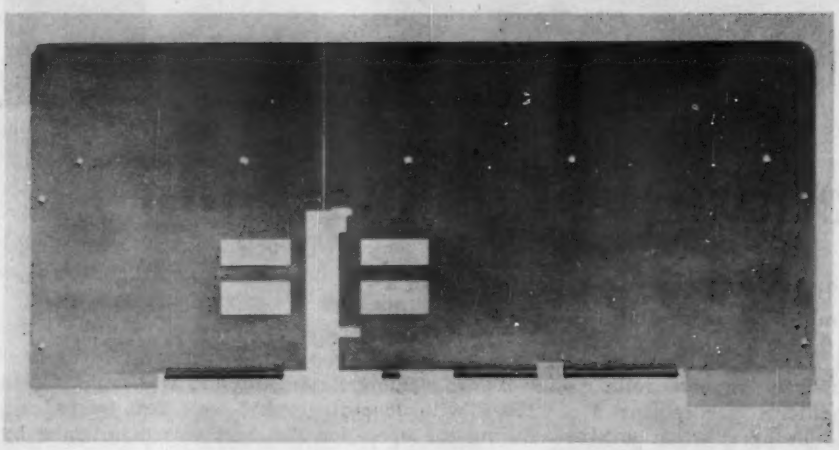
Major finishing job is on cash-register cabinets fabricated from stamped and formed sheet steel. Most welds are made on the inside, so weld bead removal is not a major problem, but exterior surfaces must present a jewelry finish. First abrasive operation is performed with a 220-grit silicon-carbide, resin-bond belt, running dry, to remove high spots and condition the metal for the second operation. Second step is with a 240-grit, silicon-carbide belt with a resin-and-glue bond, running greased. In both operations a 50-durometer rubber contact wheel is employed. Surface produced is nickel plated, buffed, and chrome plated to a jewelry finish. Total finishing time is 50% less than was formerly required.

The slip table is stamped from stainless steel strip and given a slight forming operation, followed by deburring and polishing. In place of the five former setup-wheel operations, deburring is performed with a 180-grit aluminum-oxide, resin-bond belt running dry over a 70-durometer rubber wheel; final polishing with a 240-grit silicon-carbide, resin-bond belt over a 50-durometer wheel. Finishing costs have been reduced 20% on this item.

The carriage bar for an accounting machine formerly required three or four setup wheels, is now finished with a one-belt and sandblast operation for a saving of 33 to 50%.

A lock-hood bolt is finished in one operation instead of two, a control lock slide with two belts instead of five setup wheels, and an aluminum die-cast receipt table with one belt in place of two wheels.





Slip table stamped and formed from stainless steel strip (top), deburred with 180-grit aluminum oxide belt, polished with 240-grit silicon-carbide belt (bottom)

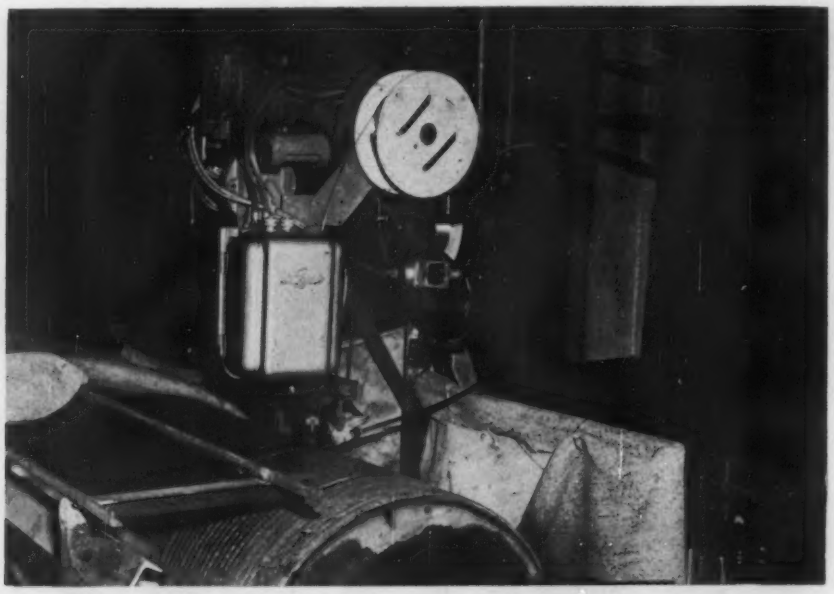
Narrow belts are used to get into awkward corners for finishing cabinets prior to plating

The tape yoke, which receives a satin finish after nickel plating, was formerly polished with four wheels, is now finished with two belts.

HOW THEY DID IT

In making the change-over, NCR's engineers installed backstands with their own modifications and set up an adjustable dust collection system to remove all dust from around the contact wheels. As a result, the line is kept clean. Shadows and blind areas have been minimized by the installation of excellent natural and artificial lighting.

Employees were trained for the new method by taking them off piecework and placing them on a holding salary for two weeks. Once back on piecework with the belts, workers found they were averaging as much pay as before but with less effort, and parts met rigid quality requirements. Because fewer operations were needed, it was possible to reduce the polishing-room force and transfer a number of workers to other important work in the plant.



Nickel coating is deposited on cast-iron roll . . . which is mounted between centers and heated with infra-red lamps

Nickel coating kills corrosion

Over 6½ miles of continuous weld now cover cast iron rolls with a coating that will not succumb to the acid conditions of a paper mill

The rapid corrosion of cast-iron "squeeze rolls," operating under acedic conditions, was causing a great deal of downtime and lost production until it was virtually eliminated by surfacing the rolls with nickel.

The problem was tackled at the Brunswick Pulp & Paper Co of Brunswick, Ga, where the pulp, after it has been bleached, is run in a continuous strip through a pair of grooved rolls that squeeze out most of the moisture.

It was the moisture that caused the trouble, because it is slightly acedic and also carries SO_2 in solution. Under the chemical attack, the cast-iron rolls quickly eroded and became pitted. This in turn, caused the pulp to stick to the rolls and tear. Then the process had to be shut down until the mess was cleaned up and a new end of the strip was threaded through the equipment. Now, however, all these problems are largely a part of the past.

Linde Air Products Co developed a special setup for the nickel-coating operation, using the sigma process. First the rolls, each 163 in. long, were machined to a diameter of 31 9/16 in. to provide a smooth surface for the weld deposit.

Then, with the roll between centers, the welding unit was mounted over it, and the equipment was set to provide a "speed" of 9 surface in. per min and a "feed" of 1 in. per rev. Combined with this motion, the welding head itself was set to reciprocate 1⅛ in. sideways, completing 48 cycles per min.

Before welding started, the roll was preheated to 150 F with 26 ordinary 250-watt heat lamps, and during the operation the heat was maintained by shrouding the roll with asbestos blankets.

The operation required 30 hr from one end of the roll to the other. After that, a second pass was made, and then the roll was machined and grooved as required. Linde has estimated the cost of resurfacing one pair of rolls as follows:

2232 lb 1/16 in. #61 nickel wire @ $3.15	$7030.00
4800 cu ft Argon @ $0.11	528.00
200 hr welding labor @ $4.63	926.00
Welding machine expense (guide tubes, cups, O-rings, etc.)	100.00
Est labor costs for machining	1000.00
Total	$9584.00

(Against this, it is estimated that the same resurfacing, if performed by the metallic arc process instead of the sigma process, would have cost $14,303.00.)

One set of these nickel-coated rolls has been in operation for a year and another set for two years with no signs of deterioration. During this time, there has been no downtime for regrooving; there has been no need to reprocess dirty, torn pulp, which used to run to about 400 tons per year; and the elimination of 6 hr per mo of downtime for the whole process, @ $600 per hr, has saved $43,200 per year.

Round Table...

Manager or Super Mechanic?

"What kind of a guy is a foreman supposed to be, Ed?"

"What's the matter, Al; criticism from Harrison again?"

"Not really; but I have been wondering about how much of a personnel manager I'm supposed to be, and how much a skilled mechanic. Should I know more about our equipment and machining methods than anyone under me, or should I concentrate on trying to keep the men working well and liking it?"

"That's a question I've had a number of times, Al. It used to be the foreman was the best worker—or the best one that didn't make everybody mad at him when he issued a few orders. Nowadays it seems to take more. Just look at all the paper work we have to do."

"Not only that; we have to be psychologists, backslappers, shoulders-to-cry-on, and go-betweens from the workers to management."

"Yeah. It seems to me, Al, that the days of real experts in the production shop are going. There are plenty of experts now, but they're doing special jobs, like machine maintenance and repair, and setup work, and stuff like that. I don't hardly ever have to work on a broken-down machine myself any more. I just call in the repair crew and let them go to work. They know more about the equipment than I do."

"But there are plenty of problems with the men, Ed. We have to deal with the union, Personnel, the medical department, charity drives, and stuff like that; not to mention ordering stock and recommending new machines and accessories. I do an awful lot of what you'd call administration work; and I'm not an administrator."

"Maybe you are and don't know it, Al. Actually, you aren't supposed to do any actual work. You're supposed to make sure your people and machines keep working. Anything you have to do to insure that is your job; and I guess you don't really have to be a skilled mechanic to fulfill those conditions."

"If you think handling my department isn't work, just try it a week."

"Sure it's work, Al; but it's not sweaty work; it's ulcer work."

• • •

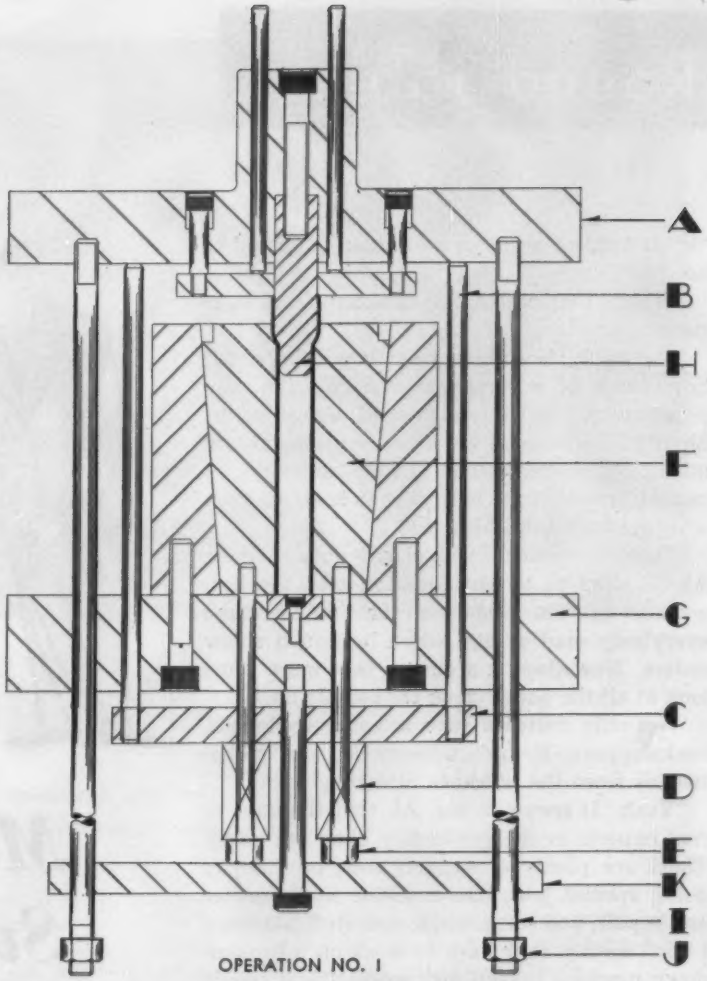
***HOW** much should a good foreman know about actual on-the-job skills in his department? Can a good mechanic handle a mechanical department; or can an unskilled administrator do it? Your opinions may help others. Discussions of earlier topics start on page 224.*

in. sideways, completing 48 cycles per min.

year.

Dies for shower arm save $61 per M

ERNEST J URBAS,
supt, Tool, Die and Engrg Depts,
and a director,
GUARANTEE SPECIALTY MFG CO, CLEVELAND



OPERATION NO. 1

By redesigning a shower arm to include the swivel ball, replacing a two-part assembly, the author will probably save his firm $25,000 per yr. His ingenious idea won the John Woodman Higgins Award for 1957 and a prize of $500 donated by the Worcester Pressed Steel Co. The award was made at the Spring Technical Meeting of the Pressed Metal Institute.

Successful control of plastic flow in three of the author's simple dies opens new vistas for use of tubing to replace forgings or machined parts. For this reason, *American Machinist* asked Mr Urbas to give you the die details and some of the process savings

First-Operation Die

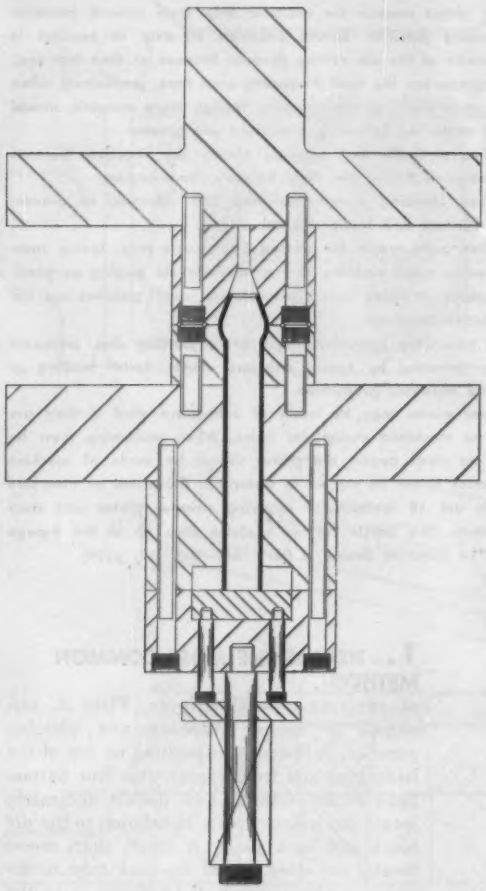
DOWN STROKE—Punch holder *A* contacts the pusher pins *B*, which are threaded to plate *C*. Springs *D* are compressed by downward movement of plate *C*. Spring compression against the heads of bolts *E* pulls down the sections of the taper-sided split die *F* until they contact the die shoe *G*. As the punch continues downward, the springs *D* continue to compress after punch *H* bottoms against the split die sections *F*. Bottoming action hardens the metal, also finishes the spherical radius of half the ball.

UP STROKE—The tube swells during bottoming and tends to stay in the lower die section as ram travel carries the punch upward. To free the tube, means must be provided to lift the tapered split die sections, so they can also open outward.

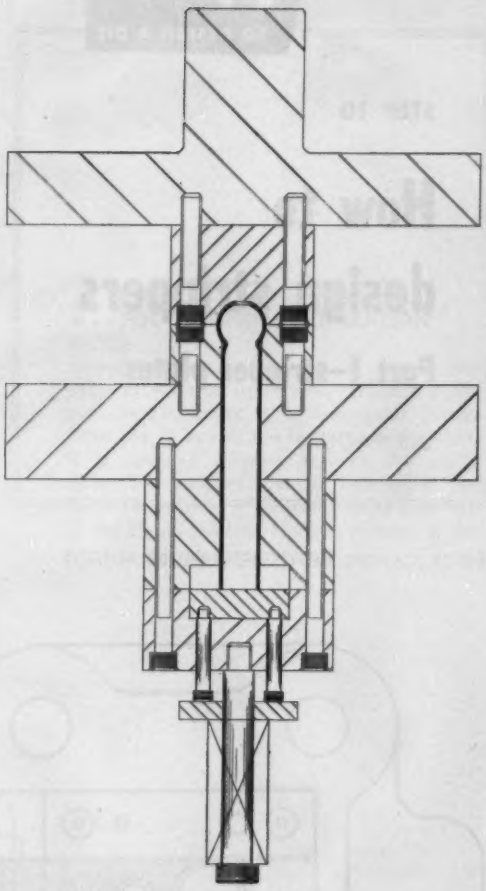
On the up stroke, rods *I* move upward until, at almost top stroke, the nuts *J* (which are adjustable and must be set in proper "time" depending on the stroke of the crank) contact plate *K*. Bolts *E* now raise the split die sections. Once the split die sections are raised, the compression springs raise plate *C* until it is stopped by the bottom of die shoe *G*. Now the tube can be removed and another inserted.

Second-Operation Die

The action of this die is self explanatory. However, this die contains the feature that a short shut height is used by building it so that a large part of the lower die is below the bolster plate. This die moves the metal inward. This action is necessary to flow the metal to a small orifice opening, which is wanted on the part.



OPERATION NO. 2



OPERATION NO. 3

Third-Operation Die

The spherical ball is now completed. If this operation is attempted without using operation 2, the spherical part of the ball would collapse, because movement of the metal would be downward, and a small orifice could not be obtained.

Tubular Material

Tubular material is purchased with reasonable tolerance on any combination of two of the three principal dimensions—the OD, the ID, and the wall thickness.

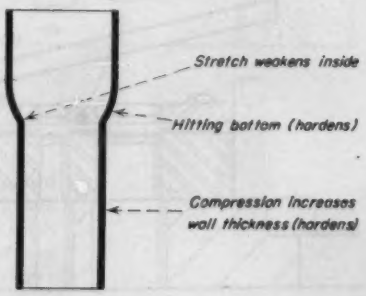
If OD and ID are specified, the wall thickness will vary considerably; that is, one side of the tube may be considerably thinner than the opposite side.

If ID and wall thickness are specified, the OD may vary considerably. If the OD dimension is functional, its variation may cause considerable difficulty.

If the OD and wall thickness are specified, the ID will vary considerably. Tubular material for this job was purchased to this specification for two reasons: (1) OD is important, because the dies were built to maximum OD, and (2) the wall thickness was specified because the part had to be threaded to a full pipe thread without cutting through. Also this choice made the ID concentric with the OD, which is important because the punch can follow through without a sidewise thrust. Such wander might occur if the wall thickness is not controlled.

Tubular material tends to compress when worked too hard with small flow radii. This compression thickens the wall of the tube and hardens the metal. If the tubular parts are nicked or bent, they are weak at these points and collapse either inward or outward.

These peculiar characteristics are employed to produce the neck directly below the ball (see sketch). This neck permits the shower more swivel action. Operation 1 compresses the tube (hardens) and strikes the spherical ball (hardens) and also weakens the tube just below the ball (stretch). At the third operation, the neck appears automatically because of the weakness induced on the inside radius of bulge, operation 1.



14 steps TO DESIGN A DIE

STEP 10

How to design strippers

Part 1—stripper plates

J R PAQUIN

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Stripper plates remove the material strip from around blanking and piercing punches. Severe adhesion of strip to punches is characteristic of the die cutting process. Because of their low cost, solid strippers are the most frequently used type, particularly when running strip stock. Spring strippers, though more complex, should be used when the following conditions are present:

1. When perfectly flat, accurate blanks are required, because spring strippers flatten the sheet before cutting begins.

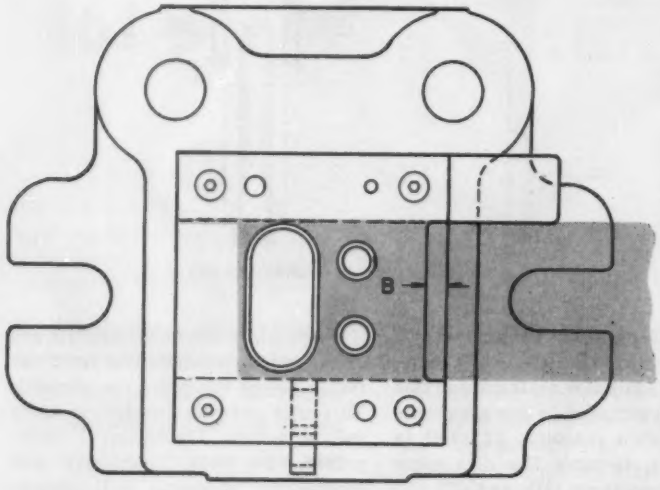
2. When blanking or piercing very thin material, to prevent uneven fracture and rounded blank edges.

3. When parts are to be pressed from waste strip, spring strippers provide good visibility to the operator for gaging purposes.

4. Because stripping occurs immediately, small punches are not as subject to breakage.

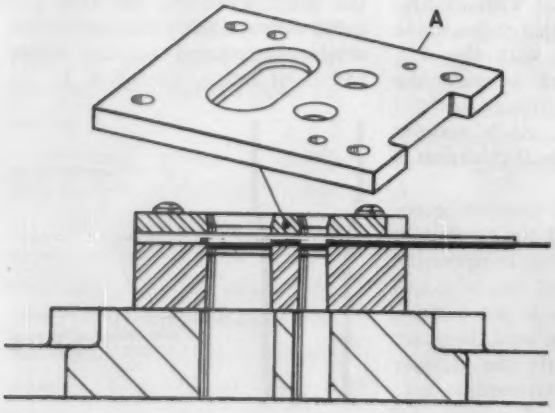
5. In secondary operations, such as in piercing dies, increased visibility provided by spring strippers allows faster loading of work and increased production.

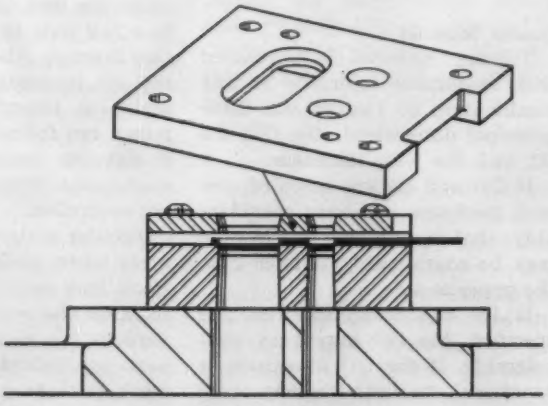
Stripper plates may be made of cold-rolled steel if they are not to be machined except for holes. When machining must be applied to clear gages, the plates should be made of machine steel, which is not as subject to distortion. Illustrated or discussed herewith are 18 methods of applying stripper plates and their components. This article further explains Step 10 in the 6-page insert—"14 Steps to Design a Die" (AM—Oct, '55, p129).



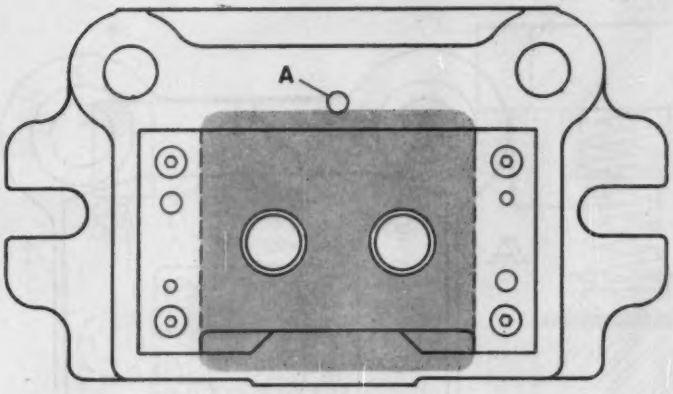
1 . . HERE IS THE MOST COMMON METHOD . . .
of applying a solid stripper. Plate *A*, machined to receive blanking and piercing punches, is fastened in position on top of the back gage and front spacer with four button-head socket screws. Two dowels accurately locate the stripper plate in relation to the die block and back gage. A small, short dowel locates the other end of the back gage to the stripper plate. Notch *B* is machined in the stripper edge to provide a shelf for starting new strips through the die.

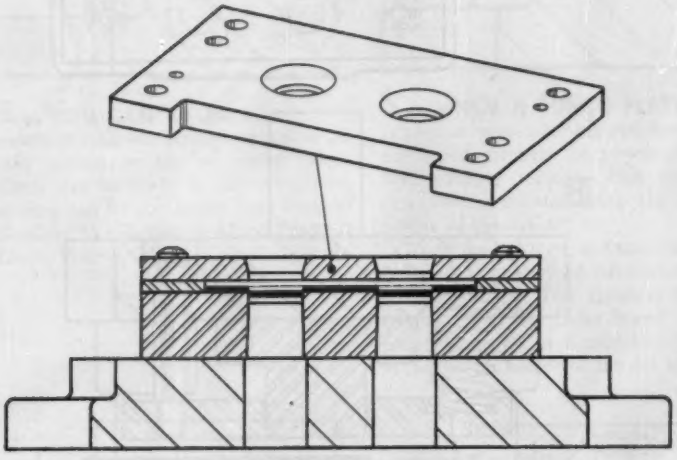
An alternate method of designing a solid stripper is to make it thicker and machine a slot in its underside slightly larger than strip width. In its travel through the die, the strip is located against the back edge of the slot. Once widely used, this method has now become obsolete except for very small dies



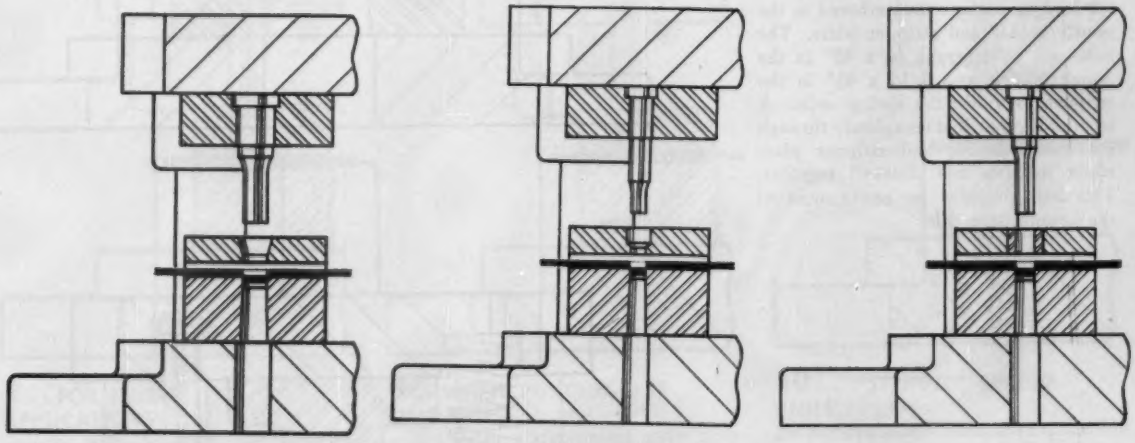


ALTERNATE METHOD





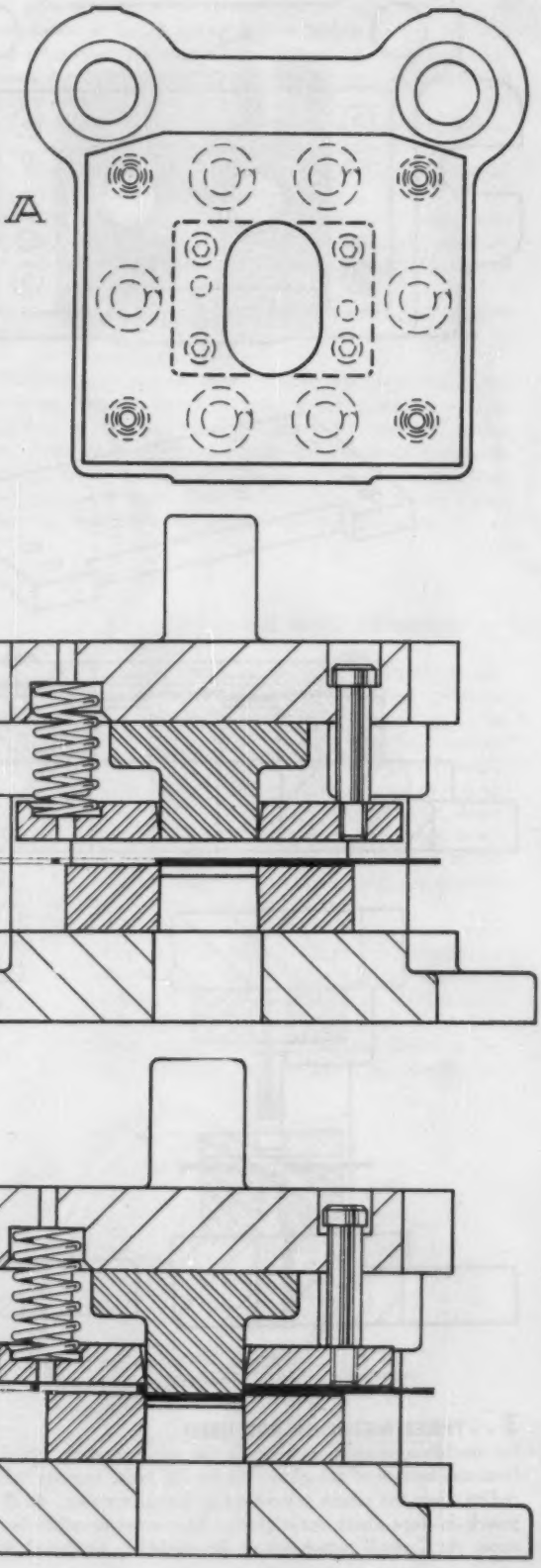
2 . . FOR SECONDARY-OPERATION WORK . . .
stripper plates are fastened on top of two guide rails set at either side. This die is for piercing two holes in a rectangular blank. Gage pin *A* locates the blank endwise, while it is confined sidewise between the guide rails. The stripper plate is relieved at the front to provide a shelf for easy insertion of the blank. The die block is relieved at the front to provide finger room



3 . . THREE METHODS ARE USED . . .
for machining punch openings in the stripper plate. At *A*, a ⅛-in. straight land is applied from the bottom of the plate. Above the land, angular relief is provided to clear the punch radius when the punch is lowered in die sharpening. At *B* the cutting diameter of the small punch is kept short for rigidity. The stripper plate is merely counterdrilled for clearance. At *C* small punches may be guided in hardened bushings pressed into the stripper

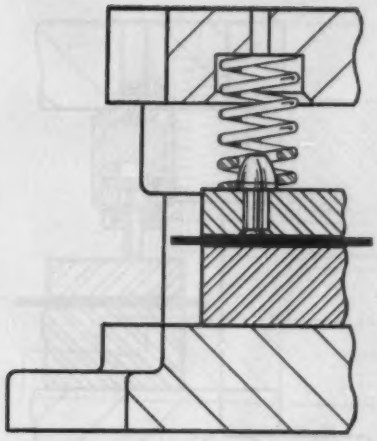
14 steps TO DESIGN A DIE

How to design stripper plates . . .

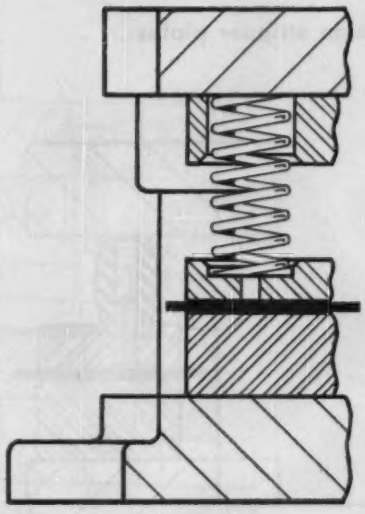


4 . . VIEWS *A*, *B*, AND *C* ILLUSTRATE . . .
the operation of a spring stripper plate. Springs, arranged around the blanking punch, provide stripping pressure. Four stripper bolts, located at the corners, limit stripper travel. View *B* shows the die in open position, while view *C* shows the die as it would appear at the bottom of the press stroke. Springs have been compressed ready to strip the material from around the punch upon upward movement of the punches. View *A* shows the punch holder, blanking punch, and punch plate inverted as they would appear in the upper right-hand view of the die drawing.

For large dies cost of the die set becomes important. So the stripper-plate corners are beveled to clear die posts and guide bushings, thereby allowing use of a smaller die set. Springs are retained in pockets counterbored in the punch holder and stripper plate. The holes are countersunk $\frac{1}{8}$ x 45° in the punch holder, and 1/16 x 45° in the stripper to guide the spring coils. A small hole is drilled completely through the punch holder and stripper plate while the two are clamped together. This hole provides for engagement of the counterbore pilot

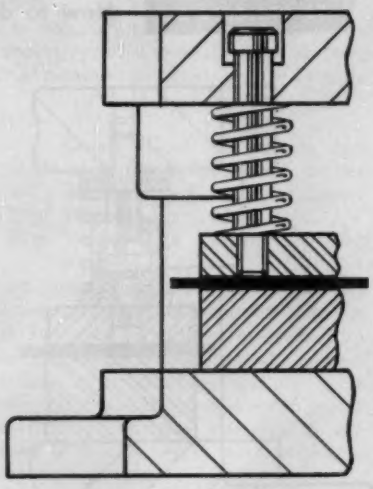


5.. YOU CAN AVOID . . .
counterboring the stripper plate to retain springs by use of spring pilots. These can be made to suit conditions, or they can be purchased from Richard Brothers Punch Div. of Allied Products Corp., Detroit, Mich.

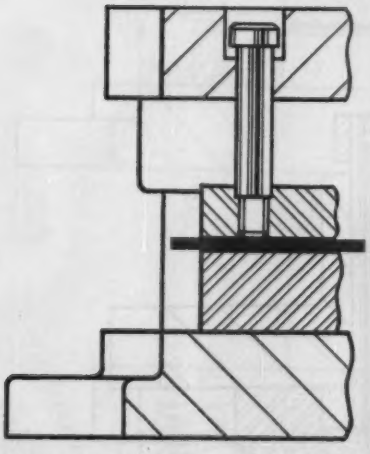


6.. WHEN A PUNCH PLATE . . .
is used to retain piercing punches, holes are bored through the punch plate to hold stripper springs. This construction avoids counterboring the punch holder of the die set.

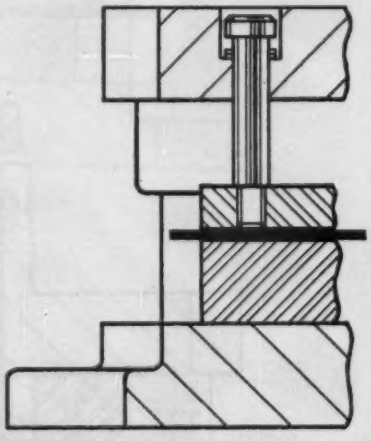
When the stripper springs are short, it is not necessary to counterbore the stripper plate. The springs are retained, either by holes bored in the punch plate or in counterbored holes in the punch holder of the die set



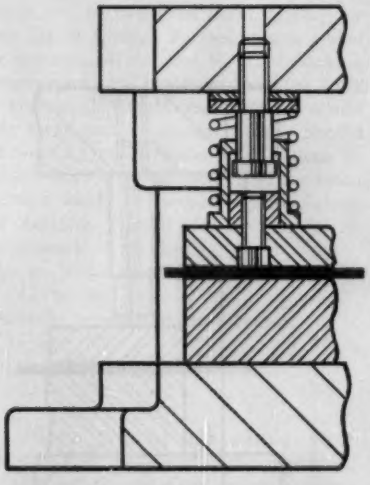
7.. FOR MEDIUM-PRODUCTION DIES . . .
springs can be applied around stripper bolts as shown. This method is not recommended for long runs because of increased wear on the stripper bolts, and because of the need to remove the bolts in the event of broken springs



8.. FOR SEVERE APPLICATIONS . . .
stripper bolts have bearing shoulders confined in short counterbored holes in the stripper plate for strength. The counterbore is usually made ⅛ in. deep



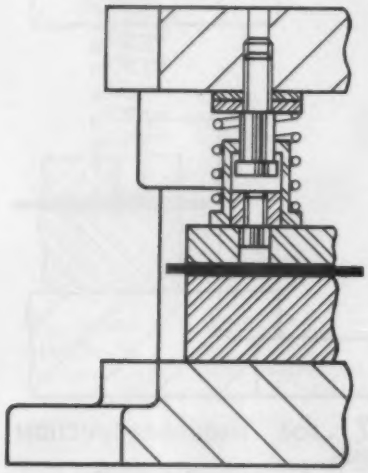
9.. WHEN PUNCHES ARE SHARPENED . . .
spacer washers are applied under stripper-bolt heads to maintain correct relationship between the underside of the stripper plate and the faces of blanking and piercing punches. The stripper usually extends 1/32 in. past the faces of cutting punches to flatten the strip properly before cutting occurs



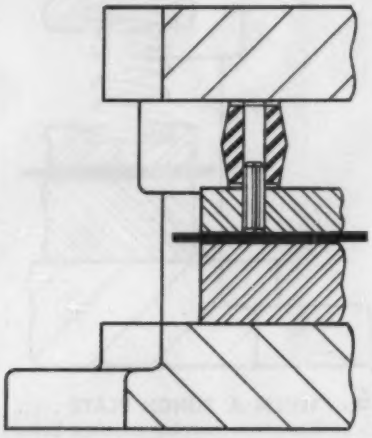
10.. "STRIPPIT" SPRING UNITS . . .
are self-contained assemblies that allow removal of the stripper plate without dismantling springs. They are available from Wales-Strippit Corp., North Tonawanda, NY. Socket capscrews, or socket flat-head screws for thin plates, retain the stripper plate to the "Strippit" units. Because pressures are self-contained, thinner stripper plates can be used and stripper bolts are not required

14 steps TO DESIGN A DIE

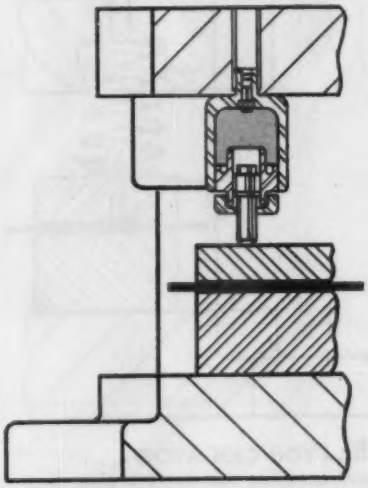
How to design stripper plates . . .



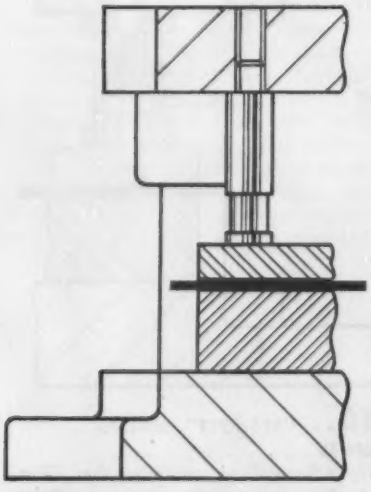
11 . . ANOTHER METHOD . . .
of applying stripper plates to "Strippits" is to insert short socket capscrews in the holes provided in the units. The capscrew heads engage holes in the stripper plate to prevent lateral movement, but stripper bolts limit travel



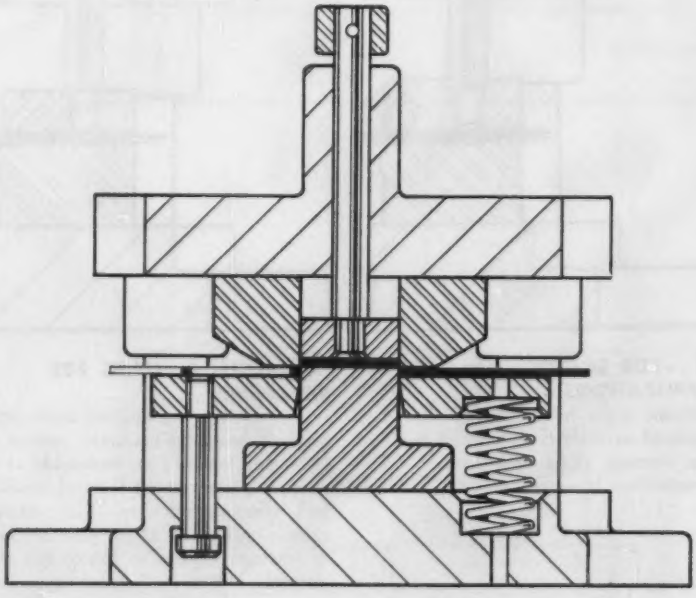
12 . . FOR MEDIUM- AND LOW-PRODUCTION DIES . . .
rubber springs may be used. These rubber components are available from Richard Brothers Punch Div. of Allied Products Corp., Detroit, Mich. Dowel pins, pressed into the stripper, retain the rubber springs in position



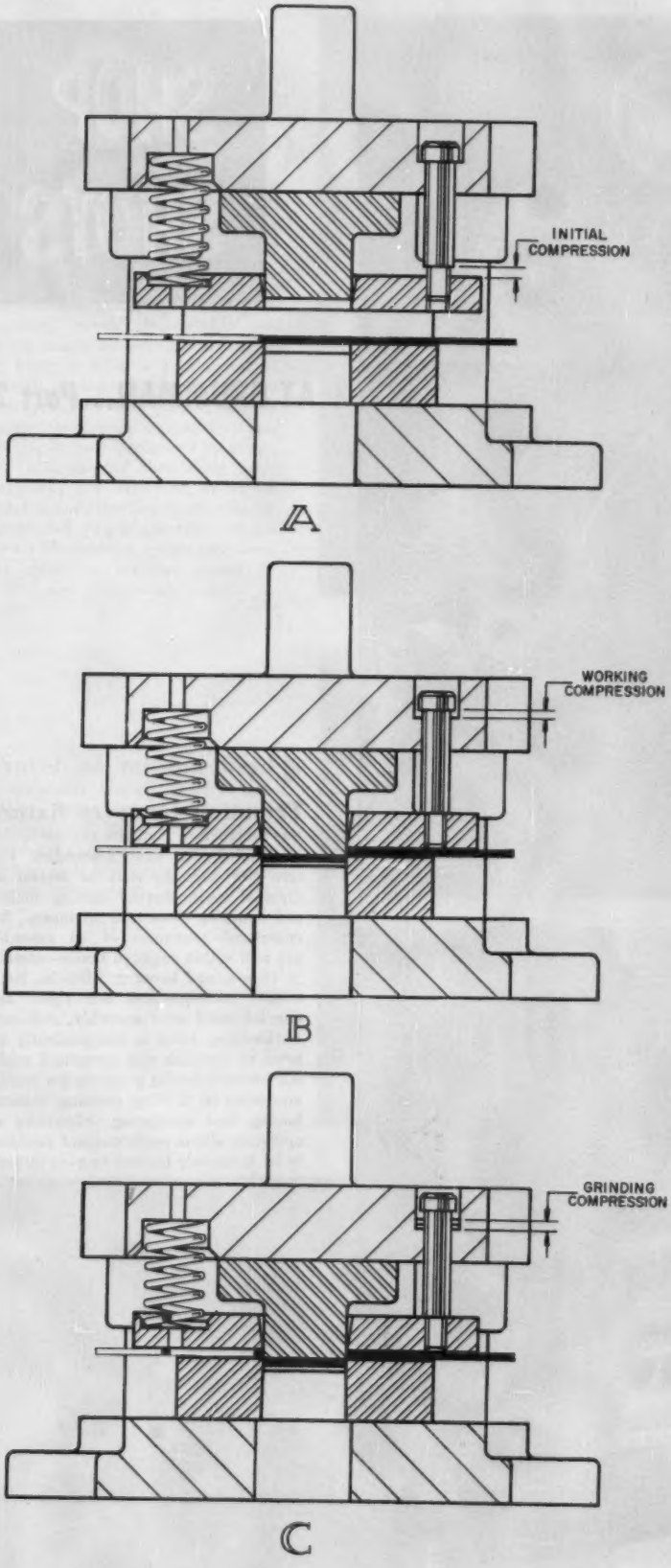
13 . . WHERE EXTREMELY HIGH STRIPPING PRESSURES . . .
are required, fluid springs reduce the number of spring units needed in the die, an important factor where space is limited. The fluid spring illustrated is available from Wales-Strippit Corp., North Tonawanda, N Y.



14 . . ANOTHER TYPE OF FLUID SPRING . . .
is made interchangeable with some sizes of standard springs. These are available from Taylor Devices Inc., North Tonawanda, N Y. Both the Wales and Taylor liquid springs are fastened to the die by threading their shanks into holes tapped in the die set



15 . . INVERTED DIES . . .
the spring stripper is reversed



16.. WHEN SPRING STRIPPERS ARE USED . . .

it is necessary to calculate the amount of pressure required to effect stripping. Stripping pressure is found by the formula:

$$P = L \times T \times 855$$

Where:

L = Length of cut. In piercing operations this is the sum of the perimeters of all perforator faces

T = Thickness of stock

P = Pressure, in pounds, to effect stripping

Stripping pressure per spring must now be found, in order to determine the number and sizes of springs required. Pressure, per spring, is listed in manufacturers' catalogs in terms of pounds per ⅛ in. deflection. Sometimes, it is given in pounds per 1/10 in. deflection, and must be converted to pounds per ⅛ in. deflection by simple proportion.

Three types of spring deflection must be taken into consideration. Illustrated at *A* is initial compression, usually ¼ in., which compresses the springs to apply a preload. At *B* is shown working compression, which is further deflection of the springs while work is being done. Sketch *C* illustrates grinding compression, usually ¼ in., which is the amount allowed for sharpening punches over a period of time.

If a spring 1½ in. dia by 6 in. long is tentatively selected, and initial compression is ¼ in., the total stored energy per spring will be twice the listed amount for that size of spring. To this sum is added the pressure for the first ⅛ in. of working compression; no more because too high a value would result, and pressure would fade away near maximum travel. Should the working compression be less than ⅛ in., say 1/16 in., only one-half of the rated pressure would be used in the calculation. For example (listed pressure per ⅛ in. compression = 20 lb):

¼ in. initial compression:	
(2 × 20)	40
1/16 in. working compression:	
(½ × 20)	10
¼ in. grinding compression:	
(2 × 20)	40
Total pressure per spring	90 lb

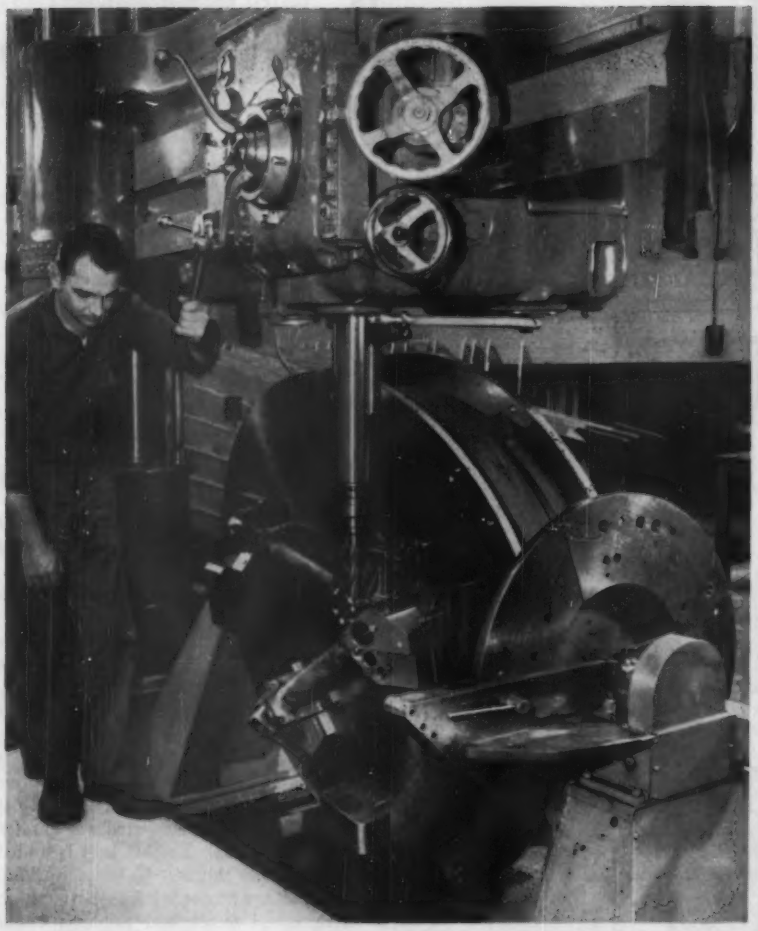
The number of springs required is found by dividing the total stripping pressure by the pressure per spring. If the number arrived at is out of proportion to the die, use fewer larger springs, or perhaps more springs of smaller size. Or pressure may be increased by applying more initial compression. Manufacturers suggest:

1. For high-speed press work, both "medium" and "high pressure" springs should never be deflected more than ¼ of their free lengths.

2. For heavy, slow-moving presses, use "medium pressure" springs with a total deflection not to exceed ⅜ free length.

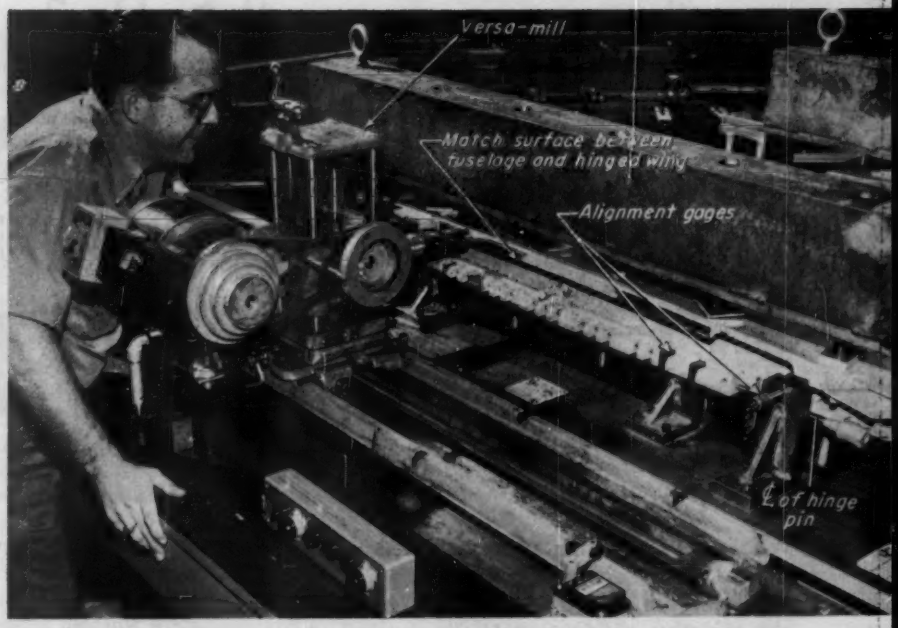
SHOP SHOTS

AT GRUMMAN...Part 2

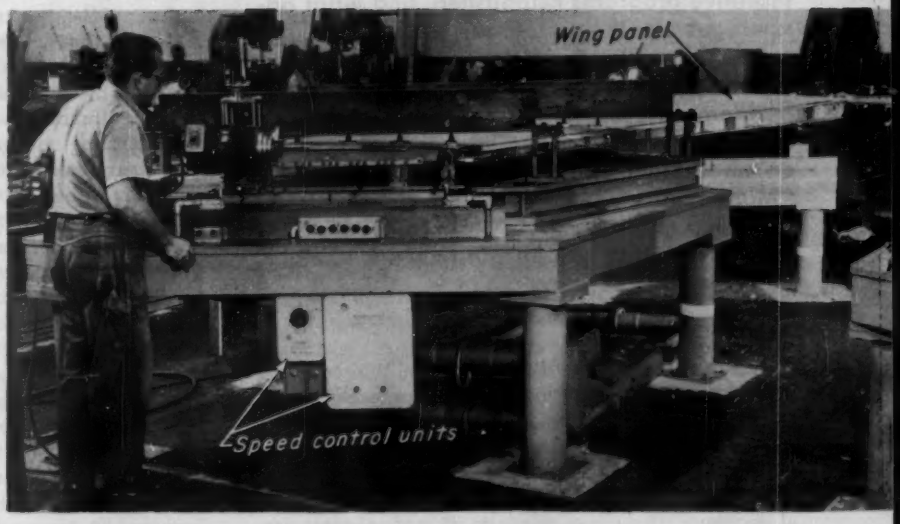


Trunnion turnover fixture was designed to facilitate the machining of landing-gear strut assemblies. Fixture now does the work of several individual tools, thereby cutting tooling and handling costs to a minimum. Accumulated tolerances of an assembly are well within required limits—angular ± 15 min, and linear ± 0.005 in. Note, fixture accommodates one right- and one left-hand strut assembly, and each workholding table is independently rotated to establish any compound angle. All twelve indexing positions are readily accessible for drilling, reaming, counterboring, and spotfacing. Simplicity of operation allows predetermined positions to be accurately located by pins through the side plates and indexing tables

Inexpensive milling fixture costing $1000 performs the same machining operation with better results than were formerly achieved on a $200,000 machine. Operation calls for machining the match surface between the fuselage and the completely assembled folding-wing panel. Relationship between match surface and centerline of hinge is held to a tolerance of ±0.001 in. Over-all cost of operation was considerably reduced because current tooling is inexpensive; machining is now performed in assembly area thereby eliminating extra handling; and work-load on an expensive machine has been reduced. Assembled wing is nested in the fixture with banking points and locating gages to simulate actual dihedral and sweep-back angles



Travel of milling head is accurately aligned to hinge centerline. Speed controls furnish the Magne-Speed Motor and reduction speed box (not shown) with constant torque and adjustable feed range for the table travel



Angle of bend selector bender now incorporates use of spacer sleeves to determine degree of angle. Standard procedure of selecting a bend angle was with threaded studs individually adjusted to required angle of bend. It was a trial and error method using tubing stock and then checking bend. The improved method allows operator to produce any bend desired without making adjustments. When a 90° bend is required, the operator pulls out sleeve marked 90° and slips it onto the spider assembly that automatically sets up machine for that bend. Because of improved setup procedure production rate increased 25%. Rack holding sleeves was placed on machine for convenience of photography. In actual use, rack mounts on a stand conveniently placed near operator

HOW TO GET EFFECTIVE SUPERVISION

SPENCER A TUCKER, Principal, THE CLEMENT MOORE ASSOCIATES, Management Consultants, NEW YORK

What elements in a supervisor's department should be closely inspected, and what should management do to insure that its foremen are effective producers? How are supervisory incentive programs established, and what advantages do they provide? This article answers these questions and provides a multitude of provocative viewpoints on the age-old problem, "To pay or not to pay a bonus, and how to pay it." This second article of a series on small-plant management—inaugurated by "Modern Management for the Small Plant" (AM—Feb 25 '57, p129)—contains concrete suggestions that can be put to work immediately in your business

Foremen or supervisors directly control the economic use of machines, materials, and manpower. Plant management is once removed and general management twice removed from their direct control. Supervisors basically are paid for consistent, effective attention to production details affecting departmental economy; the other echelons of management are concerned with coordination between production departments and other major functions of business. How effective, how "complete" are supervisors and how do they get that way?

The responsibilities of a supervisor vary widely in practice: In one plant a foreman may be an order chaser or housekeeper, in another a mechanic or quality controller. Yet all supervisors share a basic responsibility: the accounting to management of their activities. When a supervisor's activities are less than thorough because of a breakdown in communication with or counseling from management, the estrangement may be due to temporary management shortsightedness or the result of a private, self-generated interest by the supervisor to fill an immediate need. How many supervisors actively police all the areas included in their job description? How practical is it for the plant manager to police all the areas covered by all his supervisors? Yet without this effort, it is difficult for management to know whether departmental work is being done with regularity and effectiveness.

A supervisor's conduct is far from self-determined. Naturally he will have his own concept of supervision, but this opinion should be modified and compounded by management's ideas and understanding. It is then management's responsibility to make certain that the supervisor carries out orders without disrupting production balances. If, for instance, too many parts are being rejected on an assembly line, management will direct the supervisor's attention to quality. Because low rejects get the boss' approval, the supervisor becomes a quality controller and other important cost-provoking areas go unpoliced. The solution to this situation has to come from management.

In another shop, delivery speed or dollar billing may be a problem, so that the supervisor is encouraged to increase productivity. He may boost output, but perhaps at the expense of using additional materials handlers, creating additional rejects and waste, damaging tools and equipment, disregarding order sequence in favor of order size, increasing manning at machines, or increasing overtime premium costs. These conditions may wipe out any gains made possible by increased productivity and introduce considerable losses.

BASIC PROBLEMS SHOULD COME FIRST

Managements still get wrapped up in impressive "improvement programs" that take many months, sometimes years to complete, without being able to predict objectively their ultimate gains. No one will argue against the benefits of improving production methods, correcting a poor plant layout, or establishing a functioning production-control system. But how about placing the simpler efforts ahead of these—those actions which require little investment and which produce savings immediately.

Suppose a man's job, for which he received a daily

wage, consisted of crating hen's eggs. His output varied widely until management announced that it expected a certain minimum from him each day, and that if he exceeded this quota he would receive a bonus. Soon the man had increased his speed pattern and was earning a good daily bonus, but the faster he worked the more eggs he broke. Instead of looking for other areas of improvement, management very astutely added a breakage factor to the bonus: The man was told that his quota and bonus-earning opportunities would remain the same as long as breakage did not exceed 2%.

COVER ALL THE BASES

This concept should be applied to the supervision of production. Let us take the simple case of a foreman who received a straight weekly wage just for putting in time in his department, that is, for being physically present. Management told him that if he reduced his materials handlers from five to four persons, he would receive an increase in pay. The foreman then analyzed his materials-handling workload and reorganized and refined it until only four men were required. The boss saved $50 per week, gave the foreman $5, and told him that as long as no more than four men were used, he would continue to receive the extra $5 per week.

After a while, having seen that the $5 stimulus reduced the payroll by a net $45 a week, management decided to prod the supervisor into getting more productivity from his department, which was producing 100 pieces a day. He was promised a weekly increase of $15, in addition to his other bonus, if production rose to 110 pieces a day.

The foreman went right to work. He coaxed and threatened his operators; he saw that materials and tools were in the right place at the right time; he worried about the lighting and the comfort of his men. In short, he spent most of his time trying to get goods completed and shipped. He also had to increase his materials handlers from four to seven —two more than he had used before his first bonus —to get the higher production off the floor.

Fortunately management had two factors for evaluating this man's performance. If the materials-handling factor had not been recognized, management might have deluded itself into thinking that the increase in production was directly translatable into profit. Now it was faced with a payroll increase of $150 for extra materials handlers, against which could be measured the effect of the 10% increase in productivity to determine gain or loss.

What management did not know, on any measurable basis, were the other losses created by the wild drive for extra production, such as costs of additional rejects or costs of hiring and training new operators to replace those who resigned because of the foreman's whip cracking. Management did, however, know the cost increases in materials handling, and decided to counsel with the foreman to explain that a productivity increase contributes to a lowering of costs only if the other expense elements in his department can be held within certain economic levels.

By this simple technique, management was able to determine what the foreman's potential was, whether he could be trained, and what sort of candidate he might be for additional counseling and advancement. If the operation were successful, management gained a savings in materials-handling expenses, a decrease in unit direct labor, a reduction in unit overhead, a 10% increase in production, and a record of faster delivery with a shorter production cycle. The foreman received an increase of $20 a week for doing all this.

Even after these improvements the foreman's job content was far from complete, for he had time left over after policing the materials-handling and increased-productivity areas. Management then reviewed all the other elements of work directly controlled by the foreman, established similar performance standards, and requested a daily report on all activities under the foreman's control. This supervisor, after proper management counseling, now makes money for his employer.

Many foremen are hired and simply pushed into their jobs without the benefit of counseling or performance yardsticks. Too often a supervisor is hired because he worked formerly for a competitor whom his new employer respects or fears, or because he is an expert plater, or because he has successfully supervised a radial-drill department. If the new man is placed in a department where his technical experience will be used, so much the better from the technical point of view. But in all these cases the man should be hired as part technician and part manager, and not just the former alone. If the man has a poor history of cost consciousness, he should

SUPERVISORY INCENTIVE WEIGHTS were determined in one shop—a machine shop and foundry producing locomotive accessories—to be those values listed below. Note that "Rejects," occupying the smallest item of expense in the tabulation, received the second largest weighting, because of its large savings potential in the sales dollar. These figures apply to one specific company and reflect its operating policies and abilities.

	Material Cost	Direct Labor	Factory Overhead	Rejects
Average % of Sales Dollar	17	18	40	5
Element of Loss as % of Sales Dollar	3	—	—	5
Potential for Savings Under Supervisory Control (% of above element)	66 2/3%	20%	20%	100%
Relative Weight in Sales Dollar	2	3.6	8	5
Final Factor Weight (by direct proportion: Total 100)	11	19	43	27

HOW TO GET EFFECTIVE SUPERVISION . . .

EXAMPLES OF FACTOR WEIGHTING for supervisory incentive plans in four existing companies are listed below. Factor weights are those determined for companies listed in the example and are not absolutes for the represented industries. For instance, the weights assigned under Smith Foundry Co should not be used by another iron foundry without consideration of their applicability to the operations of that foundry.

COMPANY	Smith Foundry Co	Brown Metal Stamping Co	Jones Automatic Screw Machine Co	Green Metal Toy Co
PRODUCTS MANUFACTURED	Malleable and gray iron castings, etc	Appliance shells and other deep drawings, etc	Rocker shafts, ball pins, etc	Inexpensive metal toys and novelties
FACTORS				
Avoidable waste	5	5	5	20
Rejects	15	10	25	0
Indirect labor	20	30	15	40
Safety	25	5	10	0
Standards application	10	20	10	30
Maintenance and repair	15	5	20	5
Schedule performance	10	25	15	5
	100	100	100	100

be counseled with the tools provided by this supervisory incentive measurement. If presenting this objective data to him and showing him its effect on his pay and on company economy does not obtain improvements, he is not managerial material and possibly should be replaced.

HOW TO SET UP A SUPERVISORY INCENTIVE PROGRAM

Here is how to set up a supervisory incentive program that can be applied in any shop in any industry:

1. *Define the supervisor's job.* List all the elements of expense that he *directly* controls. To illustrate what might happen in one plant, we'll consider three factors: departmental indirect-labor ratio, waste-and-reject ratio, and maintenance ratio. These factors have been selected because they happen to affect production economy strongest in this particular plant. It should be noted that expenses over which the supervisor has no control are not included; he cannot be charged with responsibility for fixed costs like rent or administrative overhead allocated to production.

Some supervisory incentive plans can have as many as thirteen factors, some as few as three or four, and the factors are not always the same. The selection of factors is actually a statement of the cost-provoking elements in a company. For example, where maintenance cost in a particular shop is unimportant in the over-all cost picture, it may not be worth the clerical work needed to include it in the incentive program. But perhaps in that same shop overtime premium costs are excessive and are doled out by the foreman. Here a factor of overtime premium cost would be selected to stimulate the foreman into reducing this element.

Each of the three factors is defined as follows:

Departmental indirect-labor ratio is the ratio between direct labor and indirect (supporting or nonproductive) workers' hours actually devoted to production. For example, a weekly payroll analysis may show a certain department to have spent 400 direct-labor hours and 80 indirect-labor hours. The ratio would be 0.20.

Waste-and-reject ratio considers the cost of avoidable waste, plus the cost of re-processing rejects from customers, as well as the cost of items rejected in production. The ratio is developed by relating these costs to income from sales. For example, if the above costs in a one-month period amount to $4000 and sales total $400,000, the ratio is 0.01.

Maintenance ratio represents the cost of machine repairs, small tools, supplies, parts, and servicing and maintenance labor cost—all related in total to some standard which they serve, such as direct-labor hours or machine running hours. For example, if the above costs during a certain period amount to $80 and direct-labor hours are 400, the ratio is 0.20. This means that the company had to spend an average of 20¢ maintenance expense to support each direct-labor hour. If machine running hours are used as the base and these amounted to 4000 hours in the same period, the company spent 2¢ on maintenance to keep each machine running one hour, and the ratio is 0.02. If the payroll is used as the base and it amounted to $1600 in the same period, the company spent 5¢ for maintenance service for each dollar of gross payroll, and the ratio is 0.05.

The examples for each of the foregoing factors are given to show how the ratios are developed and what their composition is. The figures used are in no way the standard for each factor, nor are they necessarily typical.

2. *Weight the factors in proportion to their worth in the plant's economy and to the margin-for-savings potential.* With this criterion in mind, the factors might now bear these weights:

Indirect-labor ratio:	45% of bonus value
Waste-and-reject ratio:	30% of bonus value
Maintenance ratio:	25% of bonus value

A self-evident truism is that elimination of all indirect expense will increase profits. But manufacturing depends upon a certain amount of indirect expense to sustain direct labor, and this expense item cannot be entirely eliminated if the plant is to stay in business. A large indirect-labor ratio may exist in certain segments of industry, but this fact alone does not make it eligible for a high percentage rating. If dollars of cost are large but at the level necessary for sound operation, the weighting is low or may not even be considered in the supervisory

PLAN A

Dept: Stamping S'visor: John Smith Date: 11/15/54

Bonus Reserve: 10% Base Salary: $150/week Bonus Base: $15/week=100%

Factor:	Standard:	Weight:	Performance:	Earned Weight:
Indirect-labor ratio	0.25	45	0.23	.25/.23 x 45 = 48.9
Waste-and-reject ratio	0.01	30	0.02	.01/.02 x 30 = 15.0
Maintenance ratio	0.15	25	0.14	.15/.14 x 25 = 26.7
			Total Earned Weight:	90.6%
			Bonus Earned = $15 x 0.906 =	$13.59

plan. For example, a waste figure of $13,000 may be large in a company's operating figures, but if 98% of this loss is unavoidable and the maximum amount that can be saved is, say only, $260, the waste factor shrinks to minor importance.

In general weighting is a relationship between (1) the amount of dollar expense in the total income-and-expense picture and (2) the margin of opportunity for reducing it. This selection is a matter of experience, and a policy should be established for correcting weights as experience dictates.

Having determined the factors in the plan and the relative weights of each factor, we are now faced with the need to set performance standards for each factor.

3. *Set standards on each factor by investigating past performance and evaluating it in the light of past and present conditions of operations, so that a fair and reasonable standard of performance can be obtained.* Let us develop standards for our three ratios as follows:

A. Suppose that records from present payrolls show that, on the average, 28c of indirect labor is being spent for every dollar of direct labor. Setting the standard ratio at 0.28 is an admission that this level of expenditure is satisfactory. But experience has shown that this expense is higher than it should be. Let us decide upon a ratio of 0.25 as fair, reasonable, and obtainable. If the supervisor's performance reduces this figure, his bonus increases; if the ratio rises above 0.25, his bonus is reduced.

B. The waste-and-reject ratio must also be arrived at from a review of past records. This ratio, it will be remembered, concerns the relationship between (1) total sales during a given period and (2) total costs of avoidable waste, re-processing customer rejects, and cost of items rejected in production. Let's say that the data shows 3c of these costs for every dollar of sales. Analysis indicates that a standard of 0.01 would be reasonable. Thus the supervisor's bonus is determined by fluctuations above or below this standard.

C. To determine maintenance ratio, historical records are again consulted: Direct-labor costs are compared to the total costs of repairs, parts, tools, supplies, etc, and a ratio of 0.15 is obtained. As a result of the investigation, a ratio of 0.12 is selected as a standard. Henceforth the supervisor's bonus will be adjusted by performance above or below this.

We now have established the factors, factor weights, and factor standards. To complete the plan, a bonus base must be determined.

(4) *Select the basis for the monetary pay-off of a bonus to the supervisor.* Here are three plans that could be established, each with a distinct method for determining the bonus base:

PLAN A.

In plants *not* operating under production wage incentives, a sum of money for each supervisor is set aside for bonus earnings. This sum represents a percentage of his base pay, usually about 10%, which he will receive if his efforts meet the requirements set up for standard performance. If he exceeds this standard, his bonus exceeds 10% of his base pay.

This bonus, incidentally, can eliminate the usual requests for supervisory wage increases, on the theory that 10% represents a reasonable wage increase, and that that sum and more is available to him if he can earn it.

The accompanying table for Plan A shows how a supervisory incentive base is calculated. Here the following set of ratios in performance during a particular month was: Indirect-labor ratio: 0.23; waste-and-reject ratio: 0.02; maintenance ratio: 0.14.

Obviously the bonuses earned are functions of the

PLAN B

Factor:	Standard:	Performance:	Gain:	Loss:	Unit of Measurement:
a. Indirect-Labor Ratio	0.25	0.23	0.02		Per direct-labor hour
b. Waste-and-Reject Ratio	0.01	0.02		0.01	Per dollar of sales
c. Maintenance Ratio	0.15	0.14	0.01		Per direct-labor hour

Direct-labor hours in period: 400 Cost of direct labor: $800

Sales in period: $2000

Gains to company: Factor a. $800 x 0.02 = $16.00

c. $800 x 0.01 = 8.00

$24.00

Losses to company: b. $2000 x 0.01 = 20.00

Net Gain: $ 4.00

Distribute to foreman (by policy) 25%: $1.00

PLAN C

Dept.: Buffing Room — S'visor: Jim Brown — Date: 4/16/53
Avg. Dept. Productivity: 112% — Base Supervisory Bonus: 12%
Base Salary: $150/week — Bonus Base: $18.00

Factor:	Standard:	Weight:	Performance:	Earned Weight:
a. Indirect Labor	0.16	20	0.12	.16/.12 x 20 = 26.7
b. Scrap Ratio	0.02	20	0.03	.02/.03 x 20 = 13.3
c. Incentive Coverage	100%	30	70%	70/100 x 30 = 21.0
d. Safety	100%	20	100%	100/100 x 20 = 20.0
e. Repairs	0.03	10	0	Full = 10.0
			Total Earned Weight	= 91.0%

BONUS EARNED—$18 x 0.91 = $16.38

equity of the factor standards (the tighter the standard, the lower the earned weight with the same performance) and the performance of the supervisor.

In one plant manufacturing corrugated boxes at the rate of 50 million square feet a month, supervisors were receiving more than $100 a week as bonus above their base pay. The reason? Because a waste factor was incorporated in the incentive program, waste dropped from an average of 12.5% to 6.5%. This reduction amounted to a monthly savings of 300,000 square feet, the cost of which was many times the amount paid by the company in supervisory bonuses. To bring about this drop, the individual foremen simply began to salvage usable scrap that they once discarded.

PLAN B.

An alternative plan may also be used in plants not operating under production incentives. Here improved supervisory performance is evaluated in dollar savings to the company, and a policy is then set for distributing a fixed percentage of this saving to the supervisor as his bonus. Let us again use the previous factors, standards, and performance figures.

PLAN C.

In Plans A and B, no consideration was given to productivity, for it was assumed that the company did not have the production standards for its measurement. If a company does provide a wage-incentive plan for production workers, or if a measured-daywork plan is in effect, the following plan adds another controllable area for evaluating supervisory performance and is the most valid method for assigning dollar bonus amounts. This plan uses average productivity as its base and then alters that base up or down, depending on factor performances.

In effect, this plan states that the foreman is entitled to a bonus equal to the same percentage increase in base salary that workers earned by higher output, *provided the department's over-all economy does not change as a result of emphasizing productivity.* As each measurable segment (factor) of the department changes, the supervisor's bonus changes. This change may be in either direction: There is no ceiling intended for the supervisory bonus. For example, if factors *b* and *c* in the accompanying illustration had been performed at standard, the total earned weight would have been 106.7, and the foreman's bonus would have exceeded 12% of base pay.

This method has the element of compensatory economic adjustments, for lowered performances can sometimes be compensated for by a higher average departmental productivity. Thus if factor *a* had been performed at a standard rate, the total earned weight would have been 84.3%. Average productivity of 115% would have provided a bonus of $18.97.

ESTABLISHING THE PAYOFF PERIOD

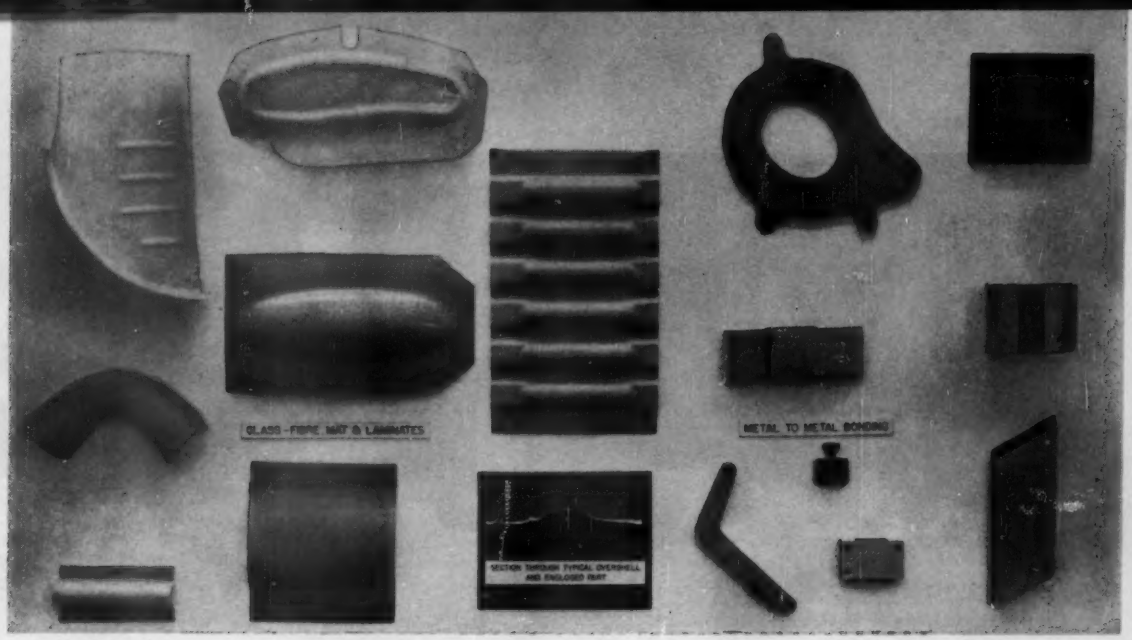
Payoff should be at least once a month, so that the supervisor can relate the bonus received to his most recent efforts. In some plans where a factor such as housekeeping is included, the standard and performance under this area are largely subjective and are evaluated periodically by a management committee.

Some plans pay off weekly. Generally these contain factors on which data is readily available weekly, such as from a payroll analysis. Frequent payoffs enable management to counsel their foremen more often and enable foremen to take remedial action while the previous week's experience is fresh.

One point should be strongly stressed: Pay the supervisory bonus by separate check; do not include it in the regular salary. This has tremendous psychological effect, for that extra piece of paper symbolizes reward for extra supervisory effort.

Feedback Quiz

1. *What are the consequences of basing supervisory reward purely on productive output?*
2. *What four steps should be followed to set up a supervisory incentive program?*
3. *What is a departmental indirect-labor ratio? Waste-and-reject ratio? Maintenance ratio?*
4. *What factors in a department should be weighted most heavily in a supervisory incentive program?*
5. *How are performance standards established for a factor?*
6. *What are three ways to select a bonus base for a supervisory incentive plan?*
7. *Why pay off any bonus plan frequently?*
8. *Why should supervisory bonuses be paid by separate check?*
9. *How can a supervisory bonus plan eliminate the problem of answering requests for wage increases?*
10. *If consistent production improvement is a basic responsibility of the supervisor, why should be receive a bonus incentive?*



Most dielectric curing to date has been done on plastic laminates; work on metal bonding has been mainly experimental. Crank fitting (bottom, right center) has 24 layers of aluminum sheet from 0.15 to 0.71 in. thick each, and was cured in 7½ min

Dielectric heat cooks metal sandwiches

Plywood and plastic industries have used RF heating for years; now this electronic power is invading the aircraft industry at Convair's Fort Worth plant. Extensive testing has shown that glass-fiber laminates and metal-to-metal bonded assemblies can be cured by dielectric heat. In many respects the method outperforms oven curing. It will be an even better bet when tailor-made equipment makes production use easier

DON W COLE, tool engineer,
manufacturing research & development
CONVAIR-FT WORTH DIV,
GENERAL DYNAMICS CORP

Heat from high-frequency electronic power works two ways at Convair. First, it cures plastic parts that are molded in metal-lined dies, where the die halves act as electrodes. Parting agents on dies prevent plastic from sticking.

Second, it cures plastic bonding materials between two metal parts of an assembly, holding them together permanently. This eliminates fasteners and welding, producing thin joints of good strength. Where large areas of metals are to be joined, plastic bonds save space and weight.

Bonding starts with a die or holding fixture, but a much lighter, simpler unit than would be required for oven heating. Only the plastic has to be heated, so total power drain is low and a massive distortion-resistant fixture is not required. The metal parts themselves act as electrodes, so only the space between them where the plastic lies is heated. Fixtures that locate matching parts are built similarly to tooling for vacuum overshell molding; and vacuum pressure is often applied to hold formed parts together.

Simpler fixtures are suitable for flat assemblies or laminations. Weight presses or clamping fixtures do the job.

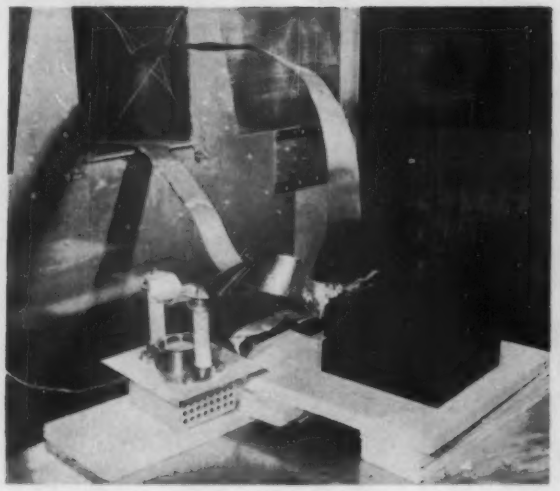
WHAT MATERIALS?

The bonding plastics, to be heated by high-frequency current, must be high-loss materials:

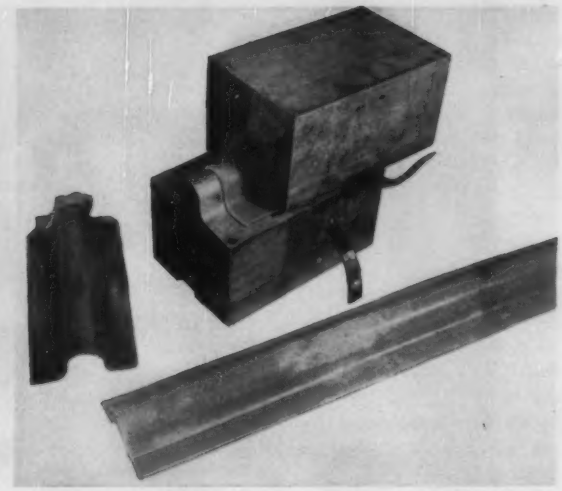
Phenolic resins
Epoxy resins
Polyester resins
Polyvinyl
Urea resin
Natural rubber

Bonding plastics are pure resins, but plastic parts to be molded or metal sandwiches that include honeycomb sections may contain filler, extender, or pigmenting materials. These may have a marked effect on the basic plastic resin, and will affect dielectric action:

Styrene—lowers loss factor



Die setup is made with heavy leads from generator, and with die supported off table by blocks of low-loss material. Unit at left is voltage divider that feeds voltmeter for control purposes. Note heavy screen shielding around cubicle, to prevent stray radiations



Sheet-metal die was made by stamping identical metal shapes, then attaching them to backup matrixes, adding leads to power supply. Continuous section of plastic shape can be pulled through

Graphite — lowers voltage strength

Aluminum powder—lowers voltage strength

Glass fiber—lowers loss factor

Carbon black—lowers voltage strength.

Titanium oxide—lowers loss factor

Alumina—lowers loss factor

Wood pulp—high loss factor, low voltage strength

Cotton—high loss factor, low voltage strength

Setups are usually designed so fixtures will not be in the RF field, but sometimes a section may have to be included, or a stray field may be set up between the electrodes and a baseplate or press bed. If so, the fixture section must be made of low-loss material such as fluorocarbon, glass, porcelain, or silicone.

Otherwise, the fixture can be made of almost any material that has low electrical and heat conductivity. Metal should be avoided, and magnetic materials must be left out.

PERFORMANCE

Results have been good, within limits established by the equipment and experience available. For one thing, most generators are designed for heating thick, low-capacitance loads such as plywood, plastics, and foam rubber. Therefore they are not ideally suited for heating metal sandwiches, although molding plastic parts is less troublesome. Metal sandwiches, however, have high capacitance, and there is considerable variation in conditions from setup to setup. Most bonding jobs are short runs and parts have irregular shapes. Therefore, an experienced man is required to tune up the generator to the right output for the work.

Maximum length of an assembly should not be more than 1/5 of the wavelength being used for power. Experience at Convair has only covered bonded metal assemblies with single-layer areas up to 100 sq in.

If a long run can be scheduled, it may be possible to experiment with the equipment to establish the best possible operating conditions. In most cases, it saves time to mark each fixture or die with tuning data for the next time that job is set up.

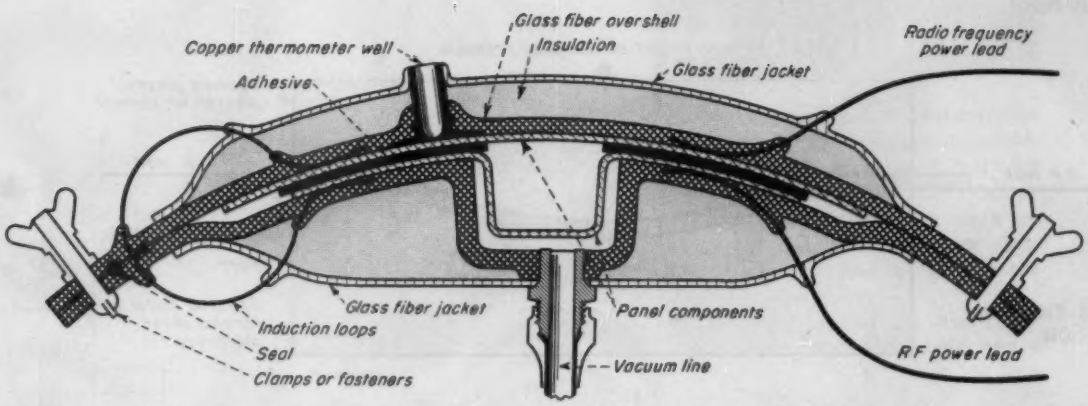
Tests of dielectric heating vs oven heating show about the same tensile strength in the plastic bond, on the average, but strength of the RF-cured bonds is more consistent. Flexural modulus is quite a bit higher with RF heating.

CAUTION—APPROACH SLOWLY

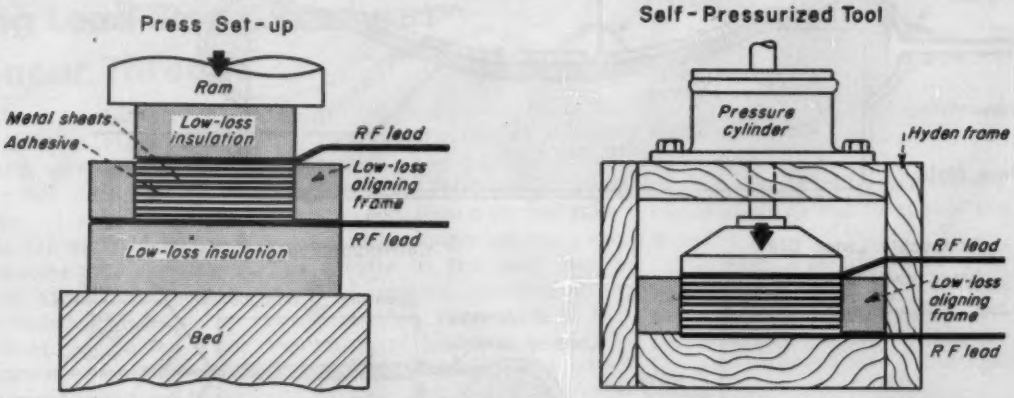
To balance the advantages of speed, low power, quick warmup, and ease of repair, dielectric heating has some disadvantages. An important one is the danger of interference with radio communications, for which reason dielectric heating must be done inside a shielded enclosure. This may be a small space or room surrounded completely by grounded wire net. The generator manufacturer will have data on this problem, and the FCC may be requested to monitor the installation to make sure it isn't broadcasting.

Keeping track of the temperature inside the die is important, but thermocouple leads must not pass inside the magnetic field or touch current-carrying members. All edges of the electrodes should be deburred and sharp corners removed to prevent arcing.

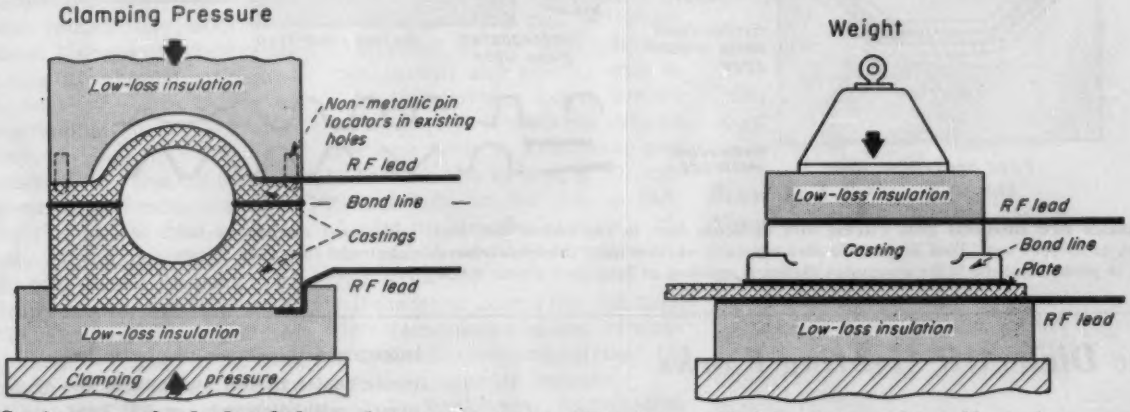
For best results, there is a present need for equipment with wider tuning ranges; and possibly a method of tuning automatically for each new load, which would eliminate tedious setup work. Aircraft jobs are typically short runs, and the loads vary greatly. Applications where a setup can be maintained for a long run may be able to use dielectric heating immediately.



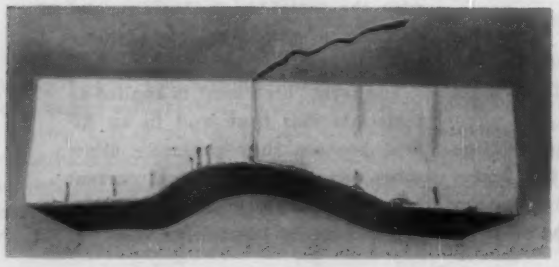
Vacuum overshell principle is adapted to RF heating to produce bonded panels. Vacuum supplies molding pressure, and electrical signal heat material between metal hat-section members. Induction loop at left end keeps large-capacitance assembly within generator rating



Metal laminating is done with simple dies, and with low-loss materials surrounding the stack of laminating layers to prevent stray radiation

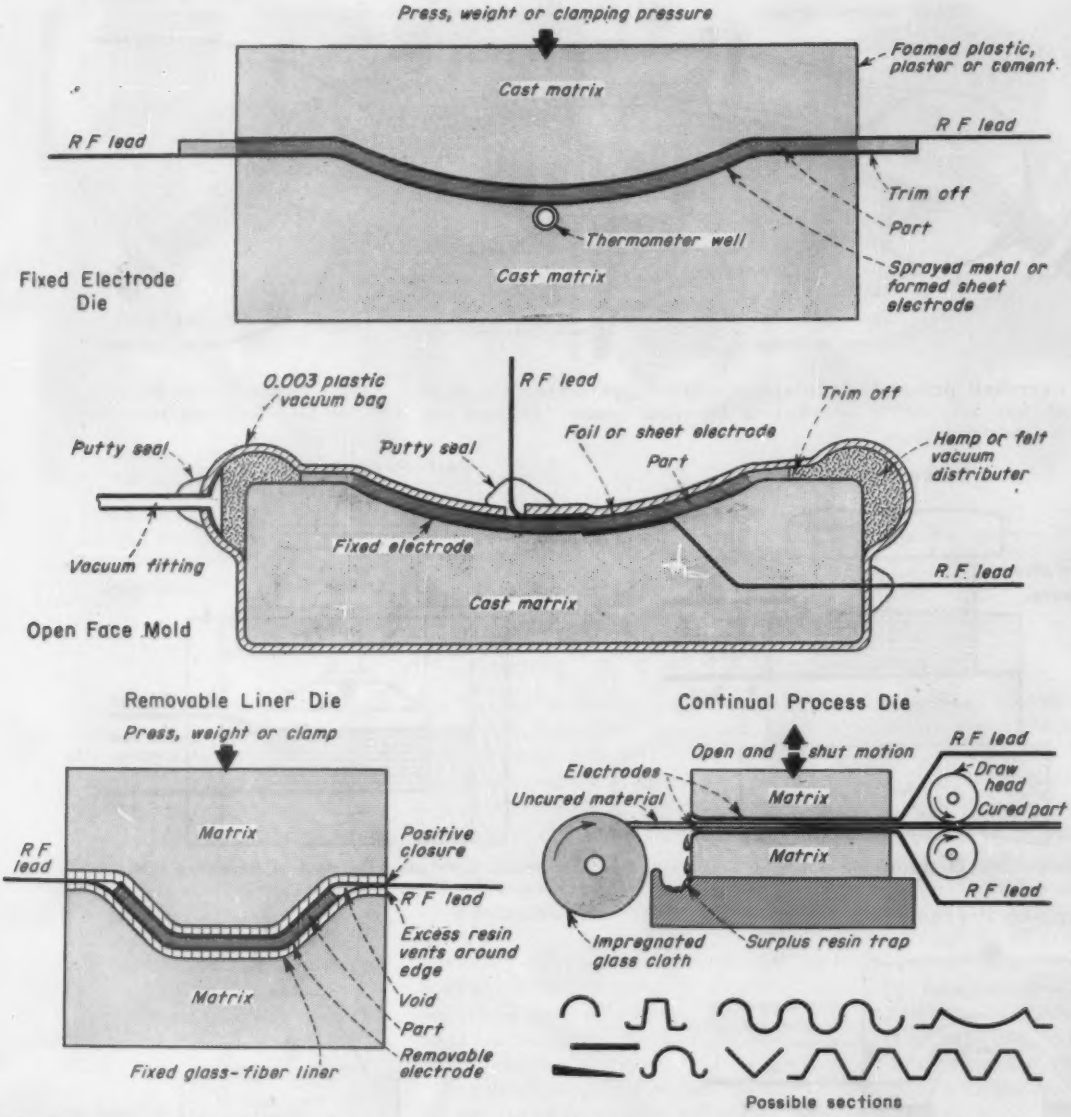


Castings can also be bonded together or to sheet stock. RF leads are attached directly to metal assembly members which act as electrodes



Section through plaster-of-paris mold shows copper loops soldered to back of foil electrode, extending into plaster to make sure grip. Drilled vents let steam escape. For precision in part, layup may be squeeze-rolled after heating, before curing takes place

Dielectric heat . . .



Plastics are molded and cured with dielectric heat in cast-matrix dies lined with metal conductors—foil, sheet, or sprayed coat. First is pressure die; second is vacuum unit; third has removable electrodes that allow leaving dies in press. Last die is for continuous dielectric molding of laminated plastic strips

How Dielectric Heating Works

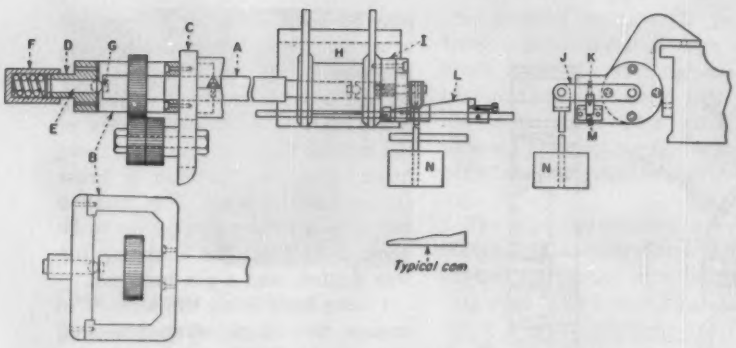
RF heating takes place when an electrically non-conductive material is placed in a rapidly oscillating electrostatic field. Molecules in the material are forced to line up with the field because they become polarized; but the field keeps changing constantly, so the molecules never do actually line up. This molecular motion produces heat, which can be controlled by the strength and frequency of the field.

The field is supplied by a generator that produces a voltage in the high radio-frequency (RF) range; from 1 to 30 megacycles.

If the material is a thermosetting plastic, the heat will cure the plastic, making it set permanently. Thus, a metal-to-metal bond can be made by inserting a thin layer of plastic between metal plates, and curing the plastic with dielectric, or RF, heat. The plastic forms molecular bonds with the metal on both sides, and becomes a glue with considerable strength.

The term "high-loss" is applied to materials that heat well in an RF field because they generally allow some quantity of electrical current to leak through—even though they are considered insulators.

Practical Ideas



Floating Lead-Screw Produces Non Linear Threads

The article entitled "Lathe Attachment—Answer to non linear thread," which appeared in (*AM*—Dec 3, '56, p154) intrigued me. It reminded me of some large-dia thread gages (12 in. to 21 in.) we had to make some time ago. Their lengths were about four inches, and each included a taper.

Our customer supplied us with samples requesting that we produce the gages of hard steel to be dimensional replicas. They were not lathe threaded, but chaser threaded immediately after heat treatment. Using a standard lead-screw, this thread could not be produced, hence the introduction of the longitudinal floating screw illustrated.

Leadscrew "A" was cut short of its conventional bearings at both ends so that it was free to move endwise. At the gear box end a sturdy box-shaped housing "B" was firmly mounted on the quadrant "C". The boss of the quadrant was held fast when set in the split end-bearing of the lathe. The far end of housing "B" was machined to take spindle "E". This spindle was cupped to receive a bearing ball.

The O.D. of housing and "D" was threaded to suit cap "F" which houses a heavy compression spring. The spring and head of spindle "E" must be a sliding fit in the cap.

Each end of the lead-screw was recessed and fitted with a carbide insert "G". It was then accurately face ground in place with the screw running through at the tailstock end of the screw, and a heavy double ribbed bracket "H" was fitted to the lathe bed. Here a cupped spindle and ball arrangement was used. The spindle in this case has a threaded portion working in a round nut "I", responding to the movements of the tracer lever "J". This lever is keyed to the outer end of the spindle, and carries a tracer pin which contacts a wedge shaped cam "L". This cam is mounted on a pull rod "M" which is attached to the lathe carriage (not shown) and moving with it.

As the carriage moves toward the head-stock it takes the pull rod and cam with it. The tracer pin, held to the cam by weight "O", rises and falls on the cam surface, causing the threaded spindle to rotate and to advance or retard the lead-screw.

If the tracer is on a rise, the spindle rotates clockwise and advances the lead-screw and carriage. On a fall, the opposite happens.

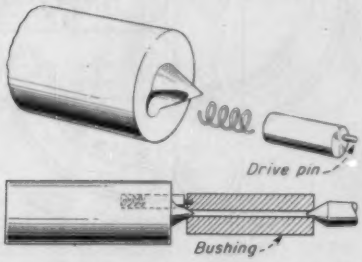
C D Mackinnon, Lanarkshire, Scotland

Drive-Pin Center Permits One-Step Grinding

I designed this drive for grinding small pins and bushings between centers where the entire surface had to be ground in one setting. It is made of round stock so it can be held in a chuck, but can also be made to fit the lathe spindle.

Before the work is centerdrilled a hole for the drive pin is drilled. The eccentric location of this hole will vary with individual requirements. For our small-dia work we had to place this hole very close to the center, and it cut into the base of the point.

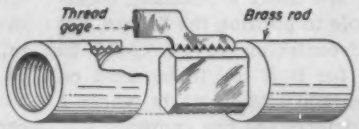
A spring-loaded pin was made to a sliding fit to the hole, and a



smaller pin was eccentrically mounted on its end to engage the work.

The work to be ground was provided with a small drive hole at the end. The center point was left soft because it might need redressing when remounted in the machine.

S D Holmes, Hato Rey, Puerto Rico



Brass Rod Traces Threads

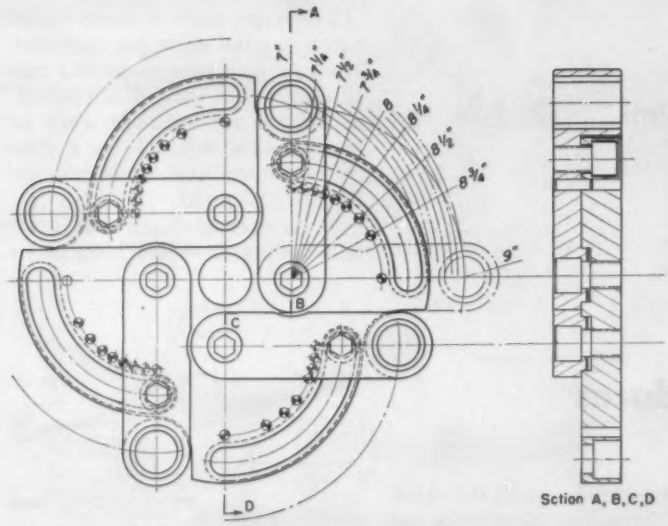
There are times when it is difficult to check a thread in a hole, either because the hole is too small for the gage, or because the thread starts below a counterbore. In such cases I take an impression of the threads with a brass rod by forcing it into the hole.

The end of the rod is fashioned into two sharp parallel edges. They can be produced by milling or they may be filed to shape. This edge-to-edge dimension should be as large as possible for maximum impression.

The impression is measured with a thread gage to find the number of threads.

Harvey Muller, Danboro, Penna

Practical Ideas



Drill Fixture Provides Many Bolt Circles

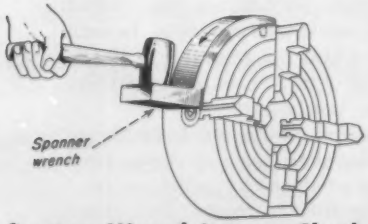
We developed the illustrated fixture to save time in layout work. It covers the full range of bolt circles we might encounter in our line of work. Though this fixture is designed to handle the layout of four or eight equally spaced holes, it can just as easily be made with three bushing-carrying arms to handle three or six holes.

We are using a centrally locating hole to position the fixture, but a self-centering device could be made for it if it's to be used on flanges and similar parts where a bore determines the center.

The drawing clearly shows the principle employed. The bushing arms are secured at their fulcrums by a short stripper bolt. There points are located 90° apart, 1¼ in. from the center and on the centerlines. All outside contour work and machining of locking slots, as well as the pilot pin holes, are on the radii from these points.

The pilot pin holes are so located that each successive hole represents an increase of ¼ in. in bolt circle. A hole is drilled and tapped in each bushing arm, to take a ½-in. locking screw. These are located approximately 2¼ in. from the fulcrum. The distance between the center of the drill bushing to the fulcrum is 3¼ in.

S G Woolley, Gainsborough, England



Spanner Wrench Loosens Chuck

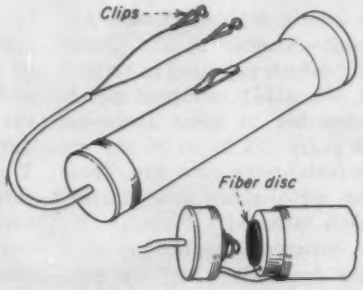
It seems one important tool has always been missing from every shop in which I have worked. That tool is a wrench to help in removing a chuck from a lathe spindle. Many men will set a block between the lathe bed, or the carriage and one jaw of the chuck, then break the chuck loose by reversing its rotation. This practice should be discouraged because it can be dangerous to the operator and may damage the machine.

The spanner wrench illustrated is my answer to the man who says that this method is the only way. But with a good hold of the chuck with this wrench, one rap by a rubber mallet or lead hammer will usually be enough to jar it loose.

There are numerous ways in which the wrench can be made. It may be band-sawed or burned out of a steel plate. It can also be cast, the way I did. I first made a pattern of wood to conform with a bit more than ¼ of the periphery of the chuck. Then, with a sand mold made from the pattern a brass casting was poured. This method left only a little cleaning up to be done. A hole for the engaging pin was drilled, and a pin inserted.

I have been using the wrench to engage the chuck wrench socket, but should this be impractical a hole can be drilled on the periphery of the chuck.

Jacob Heinrich, Columbus, Ohio



Flashlight Substitutes As Continuity Tester

My circuit tester had to be sent to the factory for repairs, leaving me without any way to check some ailing circuits. As it turned out, it was necessary to make an emergency tester quickly to do the job. After some searching for a solution, I decided on the illustrated adaptation of a flashlight, which provides a self-powered unit.

All we had to do now was to cut the circuit in the flashlight and provide a pair of leads. The former was done by insulating the spring contact in the bottom cap from the battery with a fiber disk.

The leads were entered through a small hole in the cap, soldering one of them to the flashlight case and the other to the battery shell. The other ends of the leads were provided with alligator clips and insulation where necessary.

For testing continuity, the flashlight switch must be in the "on" position.

Charles W. Shutt, Alma, Mich.

Disk Scraper Removes Unwanted Paint

We do a lot of painting of machine tools in our shop. Whether it's done by spray or brushing there is usually some overspray or spatter onto machined surfaces. Improvised scrapers, previously used, were not efficient enough and would produce objectionable scratches on the work.

The illustrated scraping tool was designed to do a better clean-up job with less chance of scratching the finished surface. It is made from a scrap piece of high carbon steel. After the turning was completed it was hardened and placed on a mandrel. This provided a means of mounting the scraper in a cylindrical grinder for sharpening.

The working end was beveled as shown and the bottom was hollow ground for proper relief of the cutting edge. The knurled handle provides a good gripping surface on the tool for easy manipulation.

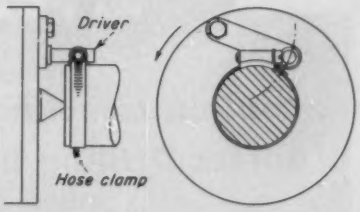
H J Gerber, Stillwater, Okla

Hose Clamp Drives Work

Our experimental department is constantly required to do small quantities of light grinding work up to 5-in. dia. While the grinding department is provided with standard dogs, we are always in trouble with awkward sizes and "must not be marked" type of work.

We have found that a nominal range of hose clamps, as those used in the auto industry, will take care of all difficulties with circular work. These hose clamps are of the type that employs a worm screw for tightening.

Some modification of the drive



pin is necessary to allow it to enter the loop of the worm screw. The screw must obviously be adjusted in tightening so the loop is perpendicular to the work, ready to receive the drive pin.

S Burgess, Little Eaton, England

For the best PRACTICAL IDEA

IN THE FEBRUARY 11, 1957 ISSUE

Winner No. 268 Received $25 IN ADDITION TO REGULAR PAYMENT

• **H J Gerber,** Stillwater, Okla **'Rubber Bumper Saves Small Drills'**

A SPECIAL ANNOUNCEMENT!

Additional yearly prize of $100.00

for the best Practical Idea published between Production Planbook issues . . .

Every contributor to Practical Ideas will now be eligible for two prizes; the regular $25.00 prize awarded for each issue, and a second Grand Prize of $100.00 to be awarded to the author of the Practical Idea judged the best in each Production Planbook. Planbook Practical Ideas are reprints of all the $25.00 winners published through the year; thus the winner of the Grand Prize will be a winner of winners. Rules for the Grand Prize contest will be the same as for the contest in each issue, except that the ideas considered must qualify by winning the $25.00 prize in the issues in which they originally appeared. Duplicate prizes will be awarded in case of a tie vote. Reader vote will be considered final.

An extra payment of $25 is made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT — $25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received — usually three to four weeks after the date of issue. The winner will also be announced in these pages as soon thereafter as practicable.

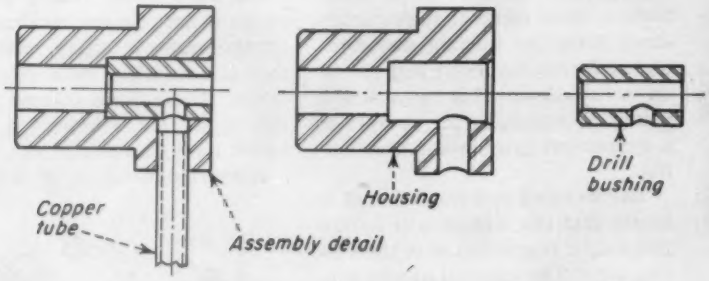
JUDGES — A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS — Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author — every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product — in terms of its usefulness to them.

WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER — Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N Y

Practical Ideas



Coolant Injecting Bushing Solves Drilling Problem

One of the most irritating problems has been that of drilling copper. This was emphasized months ago when an automatic machine was developed for drilling tube sheets, utilizing the gun-drilling process. While this is an accurate and fast process, it posed two problems. The first was the high cost of gun drills. The other was that of resharpening the drills with our overage toolroom equipment for carbide grinding.

The resharpening procedure used caused a slight variation in drill points. Because the gun drilling process is difficult to apply to soft ductile materials, such as deoxidized copper, the minute point variations caused drill life to fluctuate sharply.

Our automatic tube-sheet drilling machine is designed to operate without attention once it is started on a pattern. The point-life fluctuation made this feature a practical impossibility. Point life varied anywhere from twenty holes per grind to one thousand. The occasional drill breakage added to the tool cost. We were faced with the expense of adding costly equipment for the sole purpose of producing ultra-precision points on our gun drills.

In desperation I turned to experimenting with carbide tipped twist drill. We were to penetrate through a tube sheet 6½ times the drill dia without retracting for chip relief. Because it was impossible to get oil-hole drills with carbide tips in our size requirements (7/32 in.); and since I felt I was using the right coolant in sufficient quantities, there remained only one obstacle; that of getting the coolant to the drill point.

After a great deal of experimenting I produced the coolant injecting drill-bushing shown. The theory behind this bushing is plain. A hole is so located as to supply coolant under pressure to the drill flutes. The injection hole is located 1/3 of the bushing length from the face that contacts the work.

The flow orifice must be large enough to supply more coolant than can pass up or down the orifice created by the drill flutes. The static pressure of the coolant in our case is 100 psi. The bushing is made in two parts: One is the housing, to which a copper tube is silver soldered and which carries coolant under pressure to the assembly. The second part is a plain drill bushing with a metered hole through one side. The bushing is pressed into the housing, aligning the two holes.

The following are the specifications:

Drill dia: 7/32 in.

Drill type: Standard twist drill with carboloy 883 tip brazed to the point

Drill Speed: 3000 rpm

Drill feed: 0.0015 ipr

Coolant pressure: 100 psi

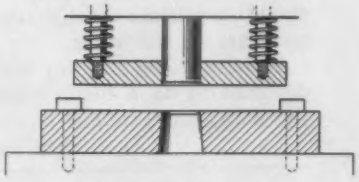
Three thousand holes were drilled under these conditions (representing about 4200 in. of hole length) in deoxidized copper. The drill was still cutting well but showed a slight amount of wear on the outer corners of the drill. Hole size was exact and finish was fully equal to that of gun drilling.

C B Weidner, Emmons, Penna

Soluble Oil Checks Rust Around Tool Grinder

A few drops of soluble oil in the tool grinder water will keep the water and accumulated grinding dust from getting rusty. You should add only enough oil to make the water milky, because too much oil will form a film.

Harvey Muller, Danbora, Penna



Pressure Plate Solves Blanking Problems

We recently had to blank some Teflon parts from ⅛-in.-thick material, rectangular in shape, with outside dimensions of ⅝ in. by ¾ in.

Teflon blanks fairly well in thicknesses up to 1/16-in., but beyond that it compresses and tears easily.

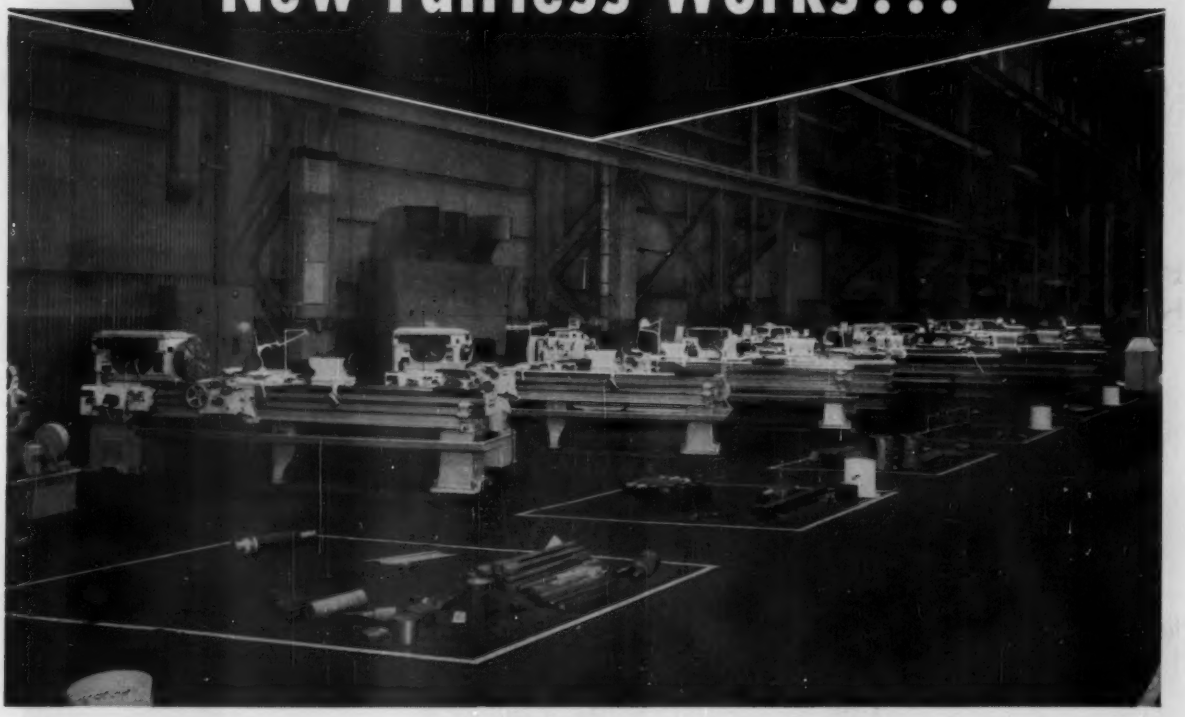
This problem was attacked by removing the conventional stripper plate from the die set. In its place a pressure plate was installed, and we used the capscrews holding the die as stock guides.

The material was packed in dry ice for ½ hour to make it less resilient, which also helped to produce a better part. With this treatment, however, these blanks expanded about 0.005-in. when they returned to room temperature. Consequently, allowances had to be made for this in the size of the punch.

As a safeguard against the chilled material, the operator should wear gloves.

Richard Meyer, Paterson, NJ

13 LEHMANN Engine Lathes NOW at work in U. S. Steel's New Fairless Works...



The largest integrated steel mill to be built at one time uses LEHMANN Lathes in its modern maintenance shops!

The Fairless Works, built on 3,900 acres and one of the biggest expansion projects built in our time, incorporates the most modern steel mill equipment available. One of the big jobs at Fairless is that of maintenance. Special shops to keep all the equipment used in this 2.2 million ton plant in top running order are an important part of Fairless.

The machine tools, cranes and other equipment necessary for cleaning, machining and repairing the mill operating equipment (which, in fact, make practically all repairs required at Fairless) include 13 Lehmann engine lathes! Some of these lathes are shown in the above photo.

Find out how Lehmann Lathes can bring efficiency, safety and speed to the operations in your plant. Write today for information or catalog — or — send prints for time and money saving recommendation.

Lehmann · Brandes
MACHINE COMPANY
GRAND at CHOUTEAU · ST. LOUIS 3, MO.

American Machinist REFERENCE

carbide tips in our size require- hole length) in deoxidized copper. *Richard Meyer, Paterson, NJ*

WORLD'S LARGEST Mechanical Double Action Press by Verson

The huge press illustrated above marks a milestone in press development . . . the largest mechanical double action press in the world.

Vital Statistics—Rated capacity is 2500 tons. Weight is in excess of 1,000,000 pounds. Height is in excess of 38 feet. Bed and ram measure 90″ (F-B) x 208″ (R-L). The press operates at seven strokes per minute.

Just another big press? No, but this unique press *is* just another example of Verson's advanced concepts of press design and engineering. Whatever your press requirements, these concepts assure you of more press for your money...more profitable production in your plant. For specific recommendations, send an outline of your requirements.

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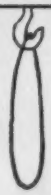
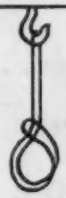
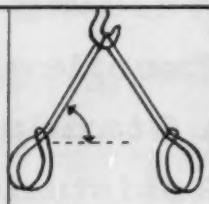
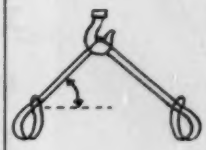
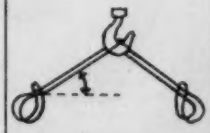
American Machinist REFERENCE BOOK SHEET

"Safe" Loads for Slings . . I

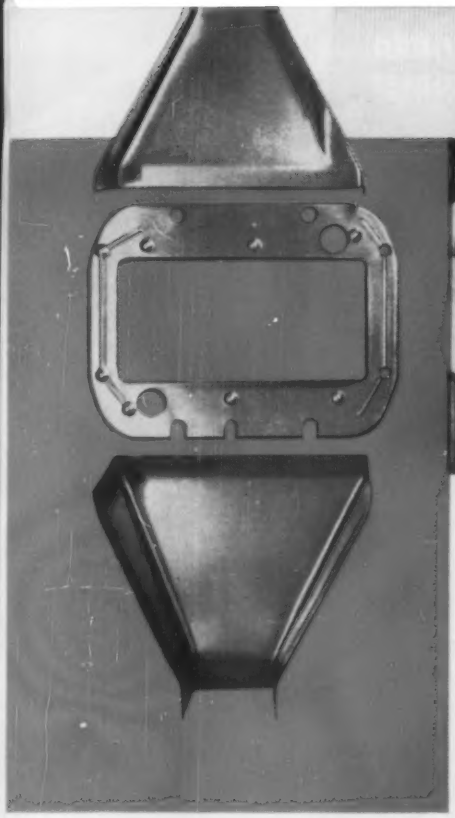
These data are taken from the "Crane Operations & Hitching Manual" published for internal use by the Allis-Chalmers Mfg Co. The values apply only under the safety regulations and conditions prevailing in the company's own plants (see article on page 129).

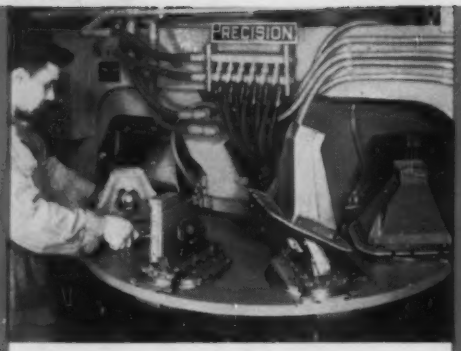
3-PLY MANILA ROPE SLINGS

Manila Rope Diameter	 Straight 2 Leg	Straight 4 Leg	 Choker 2 Leg	 60° Choker 4 Leg	 45° Choker 4 Leg	 30° Choker 4 Leg
Inches	Tons	Tons	Tons	Tons	Tons	Tons
½	½	1	⅓	⅔	½	⅓
¾	¾	1½	¾	1¼	1	¾
1	1½	3	1¼	2	1½	1¼
1½	3	6	2	4	3	2
2	5	10	4	7	6	4
2½	7	15	6	10	8	6
3	10	20	8	14	12	8
3½	14	29	11	20	16	11
4	17	34	13	23	19	13

Manila Rope Diameter	60° Basket 4 Leg	45° Basket 4 Leg	30° Basket 4 Leg	60° Basket 6 Leg	45° Basket 6 Leg	30° Basket 6 Leg
Inches	Tons	Tons	Tons	Tons	Tons	Tons
½	¾	⅔	½	1	¾	⅔
¾	1½	1	¾	2¼	2	1
1	2½	2	1½	4	3	2
1½	5	4	3	8	6	4
2	9	7	5	13	11	7
2½	13	11	7	19	16	11
3	18	15	10	27	22	15
3½	25	21	15	38	31	22
4	30	24	17	44	36	25

American Machinist REFERENCE





Welding Excellence... a Standard Resistance Welder or...

A Complete Manufacturing Method by Precision

Your choice: Buy a standard Precision resistance welder and handle the engineering and tooling details yourself—*or*—buy a complete manufacturing method from Precision. All production-planning, engineering and tooling complete—ready to produce at your rate when delivered.

Example: 28 high-strength spot welds, some through triple sheet thickness, to fabricate automotive air ducts. Production: up to 800 parts per hour—22,400 individual welds!

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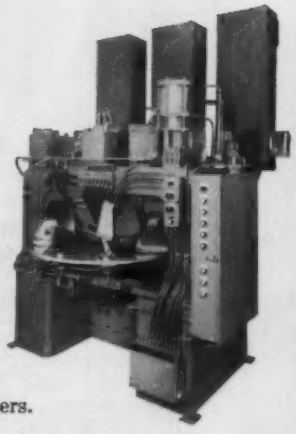
Avoid many engineering and tooling details. Call Precision in early for your high-production welding jobs. Take "the line of least resistance." Specify Precision resistance welders.



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Builders of all types of Resistance Welders and Automatic High Speed Presses

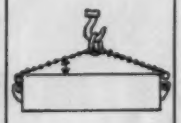
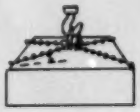
American Machinist REFERENCE BOOK SHEET

"Safe" Loads for Slings . . II

WIRE-ROPE SLINGS

(6x37 IPS-FC Improved Plow Steel, Fiber Center)

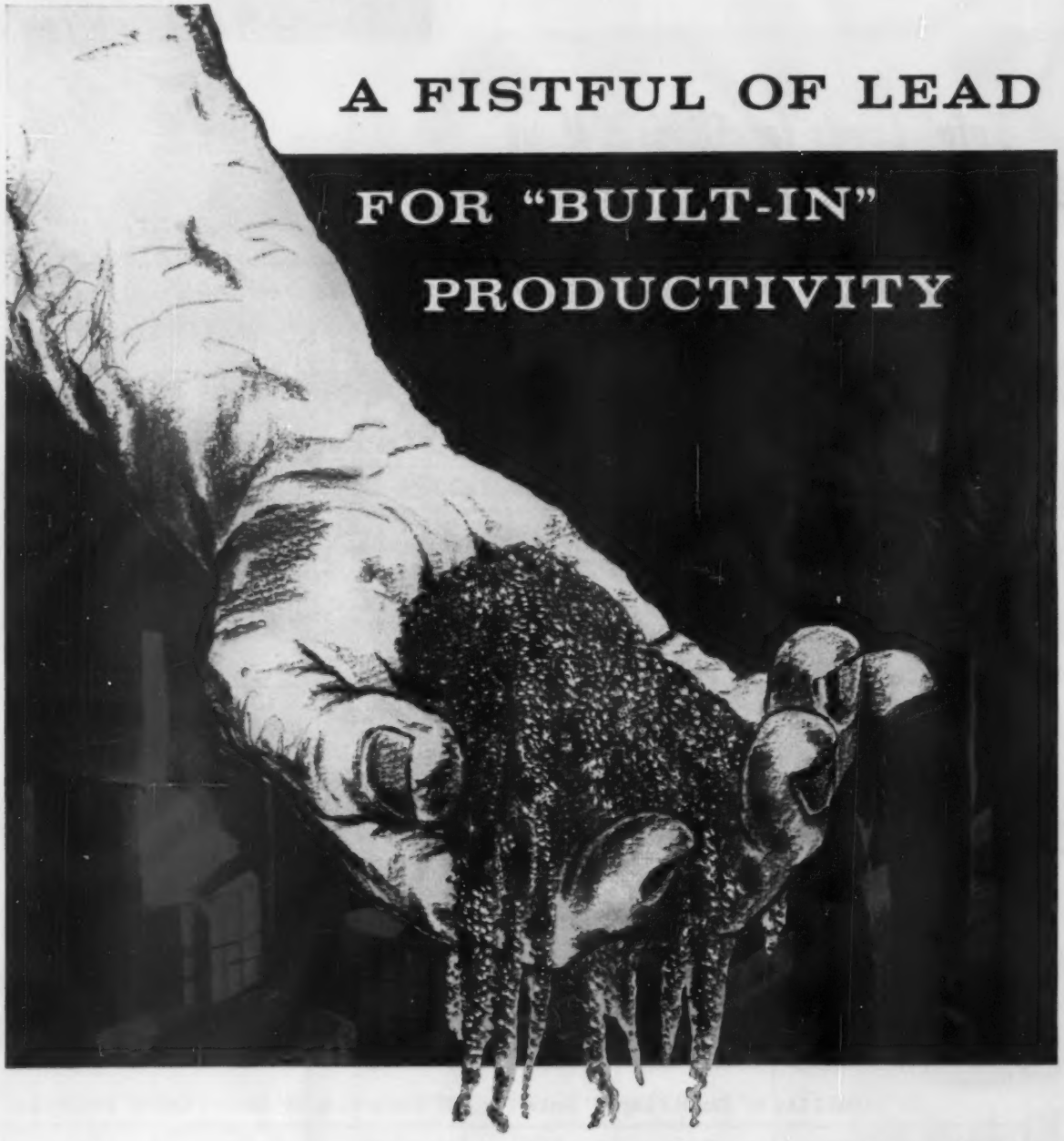
Wire Rope Diameter	Straight 1 Leg	Choker 1 Leg	60° Choker 2 Leg	45° Choker 2 Leg	30° Choker 2 Leg
Inches	Tons	Tons	Tons	Tons	Tons
¼	½	⅓	⅔	½	⅓
⅜	1	¾	1¼	1	¾
½	2	1½	2½	2	1½
⅝	3	2	4	3	2
¾	4	3	5	4	3
1	7	5	8	7	5
1¼	10	7	12	9	7
1½	13	9	16	13	9
2	21	15	27	22	15
2½	28	22	38	31	22
3	36	28	49	40	28
3½	40	34	59	48	34

Alloy Chain Diameter	60° Basket 2 Leg	45° Basket 2 Leg	 30° Basket 2 Leg	60° Basket 4 Leg	45° Basket 4 Leg	 30° Basket 4 Leg
Inches	Tons	Tons	Tons	Tons	Tons	Tons
¼	1½	1¼	¾	3	2½	1½
⅜	3	2½	1½	6	5	3
½	5	4	3	10	8	6
⅝	7½	6	4	15	12	8
¾	11	9	6	22	18	12
⅞	14	12	8	28	24	16
1	19	15	11	38	30	22
1⅛	22	18	13	44	36	26
1¼	28	23	16	56	46	32
1½	37	30	21	74	60	42
1¾	50	41	30	100	82	60

American Machinist REFERENCE BOOK SHEET

A FISTFUL OF LEAD

FOR "BUILT-IN" PRODUCTIVITY



Controlled additions of lead, introduced when the ingots are teemed, produce steel with vastly superior machining qualities compared to same steel unleaded. Leaded alloy and carbon are freer machining, permit faster feeds and speeds and greatly increase tool life. They cut clean and with a fine finish which frequently eliminates the final machining operation. These better machining qualities add up to a kind of "built-in" productivity that can mean substantial production line savings for you.

If you would like to see for yourself what "built-in" productivity can mean in your operation, ask us to lead half of your next Aristoloy order. Our field metallurgist is also at your disposal—ready to work with you in selecting the best leaded grade for the job.

For complete information, call the Copperweld office in your nearest major city, or write direct.

ARISTOLOY STEELS

COPPERWELD STEEL COMPANY

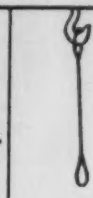
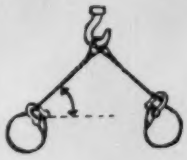
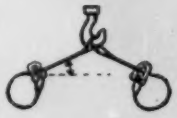
Steel Division • Warren, Ohio

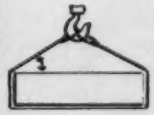
EXPORT: Copperweld Steel International Co., 225 Broadway, New York 7, N.Y.

"Safe" Loads for Slings . . III

8-PART WIRE-ROPE SLINGS

(6x19 IPS-FC Improved Plow Steel, Fiber Center)

Diameter of One Part	 Straight 1 Leg	Choker 1 Leg	60° Choker 2 Leg	 45° Choker 2 Leg	 30° Choker 2 Leg
Inches	Tons	Tons	Tons	Tons	Tons
¼	3	2½	4	3¼	2½
5/16	5	3½	6	5	3½
⅜	7	5	9	7	5
7/16	9	7	12	10	7
½	12	9	16	13	9
9/16	15	11	20	16	11
⅝	19	14	24	20	14
¾	27	20	35	28	20
⅞	36	27	47	39	27
1	47	35	61	50	35

Diameter of One Part	60° Basket 2 Leg	45° Basket 2 Leg	 30° Basket 2 Leg	60° Basket 4 Leg	45° Basket 4 Leg	30° Basket 4 Leg
Inches	Tons	Tons	Tons	Tons	Tons	Tons
¼	5½	4½	3	11	9	6
5/16	8	7	5	16	14	10
⅜	12	10	7	24	20	14
7/16	16	13	9	32	26	18
½	21	17	12	42	34	24
9/16	26	21	15	52	42	30
⅝	32	26	19	64	52	38
¾	46	38	27	92	76	54
⅞	63	52	36	126	104	72
1	81	66	47	162	132	94

QUALITY CONTROL REPORT

These sparks reveal vital facts about quality control of steel

You are naturally interested in the quality of your finished products—and if you use steel in making them, you should know about the Ryerson quality controls symbolized by this spark test.

Here a skilled Ryerson inspector is checking the carbon content of a steel bar by "reading" the sparks thrown off by an abrasive wheel. It's an amazingly accurate method of making sure that you get exactly the steel you order.

And this is only one of many rigid quality controls that protect you in every purchase of steel from Ryerson stocks. For example, a heat symbol identifies every bar of alloy steel to avoid the problem of variation from heat to heat. Another example: cylinder tubing can be furnished to more accurate inside diameter through Ryerson specs controlling O. D. and I. D. instead of O. D. and wall.

The result: steel of certified quality—assured by exacting Ryerson controls, whether your product calls for carbon, alloy or stainless steels. And these quality controls become *your* quality controls in your finished product.

These are important points to remember when you specify or purchase steel. You get extra value every time you order from your nearby Ryerson plant.

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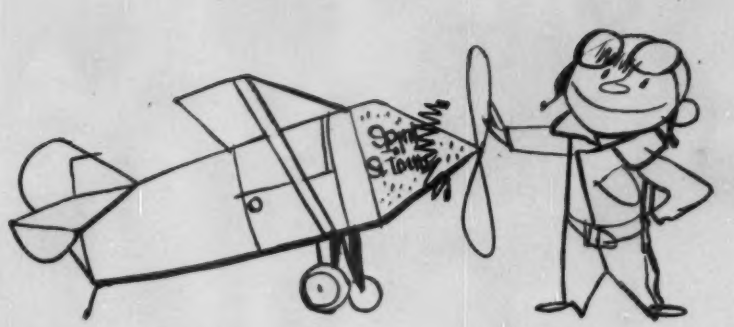
Talking Shop...



Changing Times

ELEVEN men worked seven days a week (from 8:00 am to 9:30 pm) for eleven weeks to build the "Spirit of St Louis" used recently in the film of that name. The job cost more than $20,000. The original plane cost $10,580 and was built in eight weeks. Actually this time and money was spent not on building a new plane but on rebuilding an old Ryan B-1 that had not flown in three years. We heard this story at Fairchild Engine Div, where Bill Russell—the man who supervised the job—is now a service representative. Another note on how times have changed is that this particular "Spirit" was only one of three required to make the film recreating Lindbergh's historic flight. As we recall, Lindy managed the original with only one Ryan monoplane.

Cheap Compressor

WHAT is the cheapest form of vacuum pump? Probably the commercial vacuum cleaner. One builder of electronic equipment uses 20 standard household vacuums on its production line. They remove metal fragments, create compressed air for leak testing, and remove air from the barrier bags in which military items are shipped. How did they happen to think of it? Well, the company is Lewyt and they also make vacuum cleaners.

Pipe Thickener

AN unusual solution to a tapping problem was developed by Mission Appliance Corp, Hawthorne, Calif. Gas manifolds made from ⅜-in. steel pipe with a 1/16-in. wall had to be tapped for threaded fittings. The wall did not provide enough threads to pass a gas appliance code pressure test and the problem was to meet the code without resort to heavier pipe. The solution was to spin the metal to tapping thickness. One end of a 0.343-in.-dia rod of Kentanium (titanium carbide) was ground to a 0.172-in. radius on one end forming a ball nose. This served as the spinning tool. The tool was chucked in a drillpress and rotated at 2000 rpm, heated to about 1200 F with a torch, and then forced into a ¼-in. punched hole in the manifold. Friction of the rotating tool against the cold steel raised its temperature to about 2000 F and displaced metal to bring the hole to tap size and sufficient depth. The titanium carbide spinning tool processes about 3000 holes per grind.

Gaging Checklist

SIX rules for checking gaging policies are suggested by E E Ellstrom, president of Dearborn Gage:

1. Maintain constant vigilance over procedures and schedules for the checking and maintenance of all inspection equipment.
2. Build a "margin of safety" into all equipment by allowing for finer accuracy and closer tolerances than the production part requires.
3. Keep the inspection operation as close to the machine as possible. Have production gages check the part at all stations—as frequently and automatically as possible within the bounds of practical application.
4. Have necessary master gages nearby for periodic spot check of production parts to make certain that production gages are functioning properly.
5. Have proper storage facilities right at the machine for all inspection equipment involved in the operation.
6. Make certain all personnel involved are adequately trained and skilled in the proper use of inspection equipment.

For Your Desk

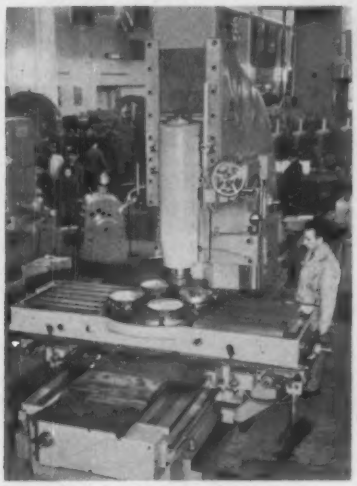
IT was Red Smith who cited, or created, this maxim: "They're never as good as they look when they're winning; they're never as bad as they look when they lose."

Automatic Blackjack

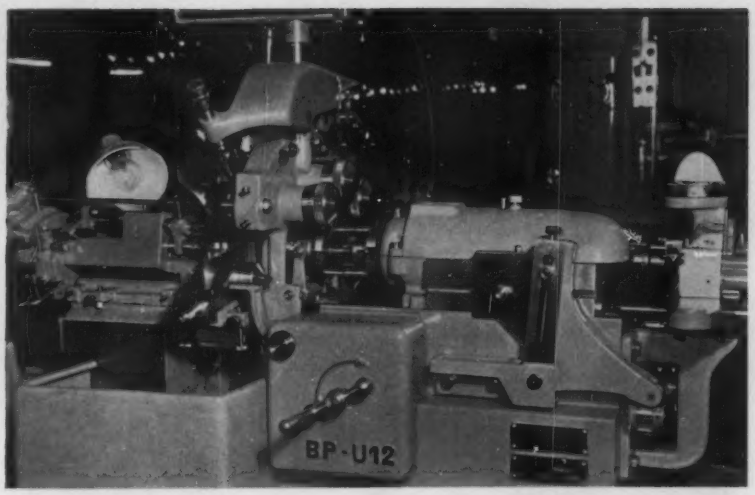
SOMEONE at the ElectroData Div of Burroughs Corp has rigged a Datatron digital computer to play blackjack in its spare time. The computer shuffles the "cards" in its magnetic memory drum, "deals" them by typing them out for each player. Players may ask for additional "hits" or stand pat. After all hands are completed, the Datatron reveals its hole card and announces the winner. It's only a sideline, but we wonder about the reaction of the dealers in Las Vegas.

Mixing Hint

SOLVENTS are mixed at Crown Cork and Seal with a Morse stationary, motor-driven drum rotater. Ingredients are put in 55-gal. steel drums in measured quantities, the drums are put on the rotater and revolved at 36 rpm. Sounds like a convenient mixing method for any finish, compound, or solvent you mix in your own plant.



Czech vertical miller . . .
has a 39.37-in. rotary section in the center of its 31.1 x 93.7-in. table which permits rapid surfacing of one large workpiece or several smaller ones. Machine's 5.5-in. spindle has 20 speeds from 11 to 900 rpm. Flywheel spindle can be fitted for heavy milling work



Polish 4.724-in. single-spindle automatic . . .
has a double-collet system of bar feed that is claimed to increase output as much as 25%. Waste time between cycles is cut by retracting the usual spindle stock before feeding in a new length of bar. Rear collet opens and withdraws at start of the cutoff operation. As soon as cutoff is completed and the tool out of the way, the front driving collet opens and the rear one moves in, gripping the stock

LEIPZIG 1957: East Germany Leads

LEIPZIG, GERMANY—Foreign visitors to this year's Leipzig Fair received the red carpet treatment from five Communist-bloc nations bidding for a greatly increased share of the Western European and Latin American machine tool markets. Most notable strides in development and production of machine tools in the last year have been made by East Germany, which claims to have increased its exports of machine tools to the West by 50% over year-ago totals. East Germany, spokesmen for that country say, is today producing more machine tools than France and Switzerland combined, is second only to Russia among the Soviet-bloc producers.

East Germany, which already exports a high proportion of its machine tool output to other Communist countries, is intensifying its sales drive to non-Communist markets as a result of the recent political upheavals in eastern Europe. It must fill such gaps as a reduction in supplies of Polish hard coal, for example, with imports of steel from West Germany. The effort was successful at Leipzig, where virtually the entire metal-producing industry of the Ruhr Valley had representatives on hand—glorying in the smallest crumbs of business that came their way. One of the many inter-German talks held behind closed doors reportedly netted East Germany $1 million worth of steel tubes, and contracts were signed for substantial shipments of machine tools to the West—gear grinders, milling machines, and presses, notably.

East German Specials

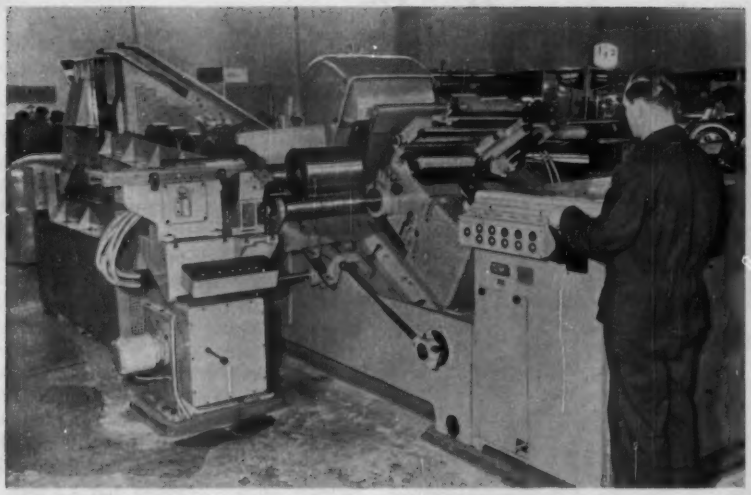
East German machine tool production is trending toward output of special-purpose and high-production machines. There was evidence at Leipzig that the Germans are producing such equipment for the automotive industries of Soviet-bloc and the Western nations.

One example of this, destined for a Russian factory, was a four-station honing and lapping machine set up for double-bore air-compressor cylinders, carried on a six-position rotary indexing table. Each station has a pair of independent vertical slides, and the hone incorporates air gages for automatic sizing.

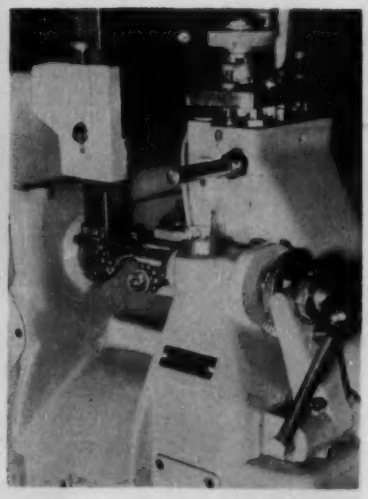
A two-spindle machine for fine-boring main bearings and facing a flywheel housing joint flange in one operation on two East German 3-cylinder auto engines, has a shuttling fixture with two work and two idling positions. Another machine, a four-spindle fine borer built for the Czech auto industry, was demonstrated at the Leipzig Fair working on aluminum engine blocks for Skoda cars. It will be incorporated into a transfer line.

Automatic loading and unloading was featured on an East German centerless grinder for large bearing races, and on a smaller grinder set up for hydraulic valve bobbins. On the latter machine, workpieces with two different diameters are dropped between the split wheels by an overhead arm. After extraction, the bobbins move past electrical measuring gages that stop the machine if the work size is beyond the preset limit.

Other machines reflecting East German advances included a hopper-loaded copying lathe, a worm grind-



East German centerless grinder . . .
was set up at Leipzig Fair for recirculating 9.84-in.-dia roller-bearing inner races to give repeated passes through the machine. Rings leaving grinder at right drop onto a gravity chute, are carried to inclined belt conveyor at rear and raised to loading chute, from which they are released to the feeding rollers. One pushbutton controls a trip at start of the loading chute, causing a ring to fall onto the inspection chute below it for spot checking. Finish grinding normally takes 4 to 6 passes, 30 rings can be handled at once



Russian gear hobber . . .
is magazine loaded, generates small gears in a 12-second cycle. Cutting slide automatically starts cross travel when gravity-fed blanks are located by the tailstock. Machine cuts straight spur gears up to 0.984 in. dia, 1.57 in. long, with 100 teeth. Hand loaded, machines handles dia to 1.97 in., with 300 teeth

Soviet Drive for Western Tool Market

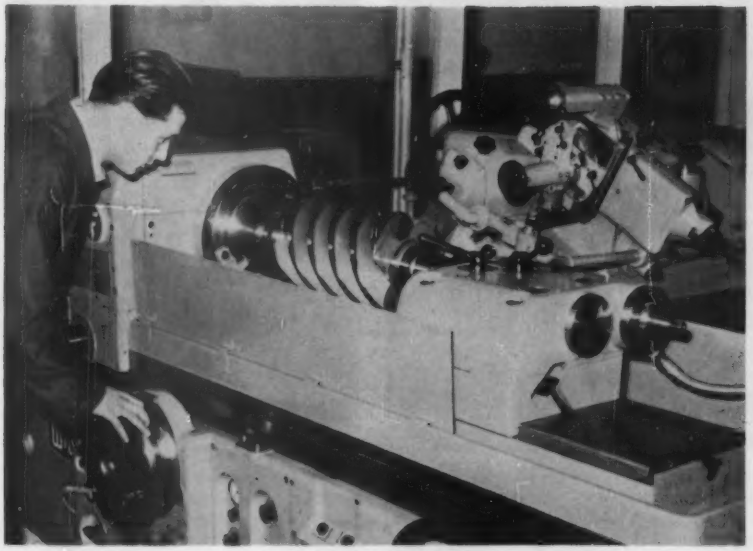
er, and a gear hobber with punch-card programming. For railway applications, an East German builder displayed a two-spindle copy miller for simultaneous machining of both ends of locomotive connecting rods, and a rail switchblade planer.

Machine tool catalogs available at Leipzig were offered in four bound volumes. Dealing with some 400 basic varieties (and many more sizes) of machines for export, the books indicate that there are today few gaps in the scope of East German production, and that emphasis is being placed on certain lines.

For example, the now-nationalized Pels factories are listed as offering scores of different presses, both mechanical and hydraulic, and up to triple action. One double-action crank press alone is made in 26 sizes, ranging up to 2000 tons and a 16.5-ft bed. East Germany is also concentrating on production of sheet metal-forming machines, including a group of semi-automatic machines for making containers—equipment for notching, bending, flanging, seaming, and other operations.

Red China-built opensided planer . . .
has 236 in. x 58.6 in. table with two tool slides on the crossarm and one on the column. Cutting speeds range from 236 to 2362 ipm, with slow table movement at the start and finish of each cut. Machine weighs 40 tons, has 12 motors

LEIPZIG FAIR (continued)



East German worm grinder shown at Leipzig . . .
can plunge-cut one or both flanks and can handle worms of up to six threads with automatic work indexing and cycling after each is completed. When the grinding wheel feeds in to its adjusted depth, the rotating work traverses longitudinally on its table. Only four change gears are needed for grinding normal pitches. Capacity is 5 to 24 module, and swiveling head provides for lead angles up to ±35°. Machine has a 3-diamond trueing attachment for manual profiling of the wheel. Swing is 6.3 in.; between centers: 31.5 in.

Among the heavy buyers of East German equipment were the South American countries. One publicized deal with Argentina involved $200,000 worth of machines. An important group of Colombian merchants promised substantial orders in exchange for coffee purchases. There was even a $50,000 sale to a U S buyer.

Russia displayed a score of machine tools in its mausoleum-like pavilion, where the Graeco-Victorian decor of the past was moderated in favor of a more up-to-date atmosphere. The exhibits were an odd assortment of old and fairly new machines, some of which (perhaps the same ones) were seen at Leipzig several years ago. Machines of some interest were a helical gear cutter, a hopper-fed hobber for very small gears, and a universal spiral grinder with internal grinding attachment.

Russia's Exhibit Disappoints

In the light of recent Russian Reports in *American Machinist*, the exhibits at the Fair did not at all represent the Soviet's most advanced machines. There was apparently little attempt to impress Western technicians, and the propaganda value was minimal. The explanation of this may be bad organization or bureaucracy — or perhaps commercial considerations, transport costs, or export availability of machinery determined the selection. In any case, there were no reports of business done in this line.

New Czech Tools

More significance could be attached to Czechoslovakia's exhibit, which, by contrast, included some of its newest equipment, including a cold-forming swaging machine for reducing bars and forging internal threads; a two-slide chucking lathe with hydraulic copying, a vertical miller with rotary circular section in the center of the main table, and a 14-spindle, two-station machine set up for drilling and boring sewing-machine bases.

Polish Automatic

In addition to a sizeable collection of basic and heavy-duty machines, Poland displayed an improved version of its 4.724-in. single-spindle automatic. The BP-U12 features a new method of bar feed which is claimed to reduce waste time and raise output by as much as 25%. The driving collet is in two parts, one for work clamping and the other for feeding. As the cutoff tool approaches the stock at the end of the cycle, the rear collet opens up and retracts the distance of the next workpiece. When cutoff is completed and the tool withdrawn, a new length of bar is immediately fed through the now-open forward collet. Engineer Witold Borkovski, co-designer of this machine, was on hand at Leipzig for an enthusiastic demonstration.

One novelty in the small Hungarian display was a portable pneumatic grinder. The vertical column carries an arm with an adjustable head, and the supporting base is designed to rest on a machined flat surface. Air jets in the base raise it 0.0004 in. from surface for easy movement.

West Germans again predominated among the non-Communist exhibitors, and firms represented in the machine tool hall included Clausen & Petermann, Gildemeister, Alfing, Arthur Klink, Peltzer & Ehlers, Adolf Waldrick, Klingelnberg, and Pee-Wee. A measure of the West Germans' uninhibited approach to Soviet trade was a Russian-language issue of a technical export magazine published by the Düsseldorf *Handelsblatt* to coincide with the Leipzig Fair. Crammed with 90 pages of ads—mostly from machine tool makers—it was intended for free distribution in the USSR.

King-sized casting . . .
one of the three largest ever made in Canada, is machined at the Lachine, Que, Works of Canadian Allis-Chalmers Ltd. The castings are part of a 16,000-ton, 3-unit hydraulic O-ing press for forming welded steel pipe

Tomorrow's Challenge to Production

What to Do When Planes Glow Cherry Red As They Fly at 10,000 Mph?

NEW YORK—Biggest job ahead for the aviation industry is to learn to work with materials that will withstand the tremendous skin temperatures built up as planes travel through the air at 10,000 mph—and to develop methods for removing the heat so that people, fuels, instruments and controls can exist in the vehicle. That's the challenge facing aircraft engineers, 500 aircraft production people were told at the Society of Automotive Engineers' Aeronautic Production Forum at the Hotel Commodore here April 2.

Within the next 10 years, piloted aircraft will travel at Mach 10 speeds (10,000 mph) and at altitudes of 150,000 to 300,000 feet, or even higher, Colonel P F Nay of USAF Air Research and Development Command, and Dr W J O'Donnell of Republic Aviation Corp told attending engineers in a prologue to the manufacturing facilities session. That means that planes will glow cherry red as they hurtle through the night skies with skin temperatures higher than 1200 F. Right now we have the power plants and the mechanical know-how to achieve this speed but how do you lick heat input? Among the materials under study are tool steels such as those used in forging dies because of their hot strength, ceramics, molybdenum-base alloys and titanium alloys. But how do you work them?

Tomorrow's Machine Tools

It appeared likely, with these tough materials in view, that machining would be minimized to the greatest possible extent; that the trend would be to *chipless* machining, using rolling, stamping, extrusion, powder metallurgy, precision casting, etc—and avoiding the heavy roughing cuts. Emphasis will be on machine tools for finishing, with designs providing an ability to produce much closer tolerances, more complex shapes, and much higher machining speeds. Built-in automatic inspection devices will simplify quality control. Automatic control will be significant.

Electrical-discharge machining found a considerable interest and appears to have a sizable potential for working difficult materials, especially as it causes no distortion and its efficiency is not impaired by the hardness of a material.

Welding, and weldments, also appear to hold even greater promise for the future as many of the components must be liquid and pressure tight. And, welding lends itself to fabricating complex shapes out of simpler sub-assemblies. However, much more development is necessary in pre-treatment and after-treatment of welded joints and in non-destructive testing.

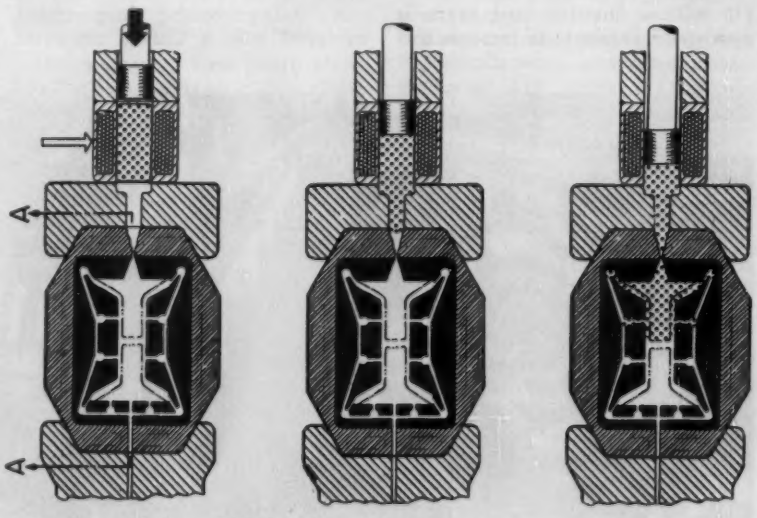
It is likely that the aircraft plant of tomorrow will be totally air conditioned—but from a functional standpoint rather than just for employee comfort. Close-tolerance machining, precision inspection, dust, automatic controls, and the effect of expansion and contraction on tooling as air temperatures change throughout the day have already established the value of an air conditioned shop. Nevertheless, one participant pointed out that the government does not allow air conditioning as a facility expense except for instrument work.

Tomorrow's Aircraft Plant

Most of the emphasis, for plant location and construction in the next decade, was in terms of a world political atmosphere requiring military readiness. However, while it was agreed that builders of new plants should consider going underground, it was also the general belief that underground building would not be widely practiced—unless world tension increased or the government paid for construction.

It is likely that decentralization of production and dispersal of manufacturing centers will be even greater than at present—but more as a result of the trend to suburban living, labor markets, business economics, and the interest in one-story plants, than for purely defensive reasons.

Other highlights of the session included the belief that aircraft plants would be higher, because tail-height is increasing, but not necessarily any wider than at present as wing width is narrowing. Greater tail-height can be processed in existing plants by lowering floor levels below ground. Aircraft size, in answer to one question, is difficult to estimate and varies with the purpose—but it was thought that the



Extrusion molding of light alloys . . .

is new process that is a cross between extrusion and die casting. A heated extrusion billet is forced into a split-metal mold under carefully controlled pressure conditions. Properties are similar to those of forgings but shape and alloy restrictions are more like die casting. Evaluation of the process is reported by the Navy Bureau of Aeronautics. Lower die and operating costs are anticipated

NEWS REPORT

TOMORROW'S CHALLENGE TO PRODUCTION (continued)

passenger and cargo airplane of 1965 might be three times the size of the new 150-passenger Boeing jet transport. Also, it is entirely possible that power plants will reach 100 inches in diameter. (Lathe builders please note.) However, the general trend is toward the use of more engines per aircraft rather than fewer large engines.

The sub-contractor is taking on the role of specialist, rather than the all-around job shop of yesteryear. He will supply one of three phases—process, component, or system—and the trend is toward system subcontracting, which also develops "second sources."

Manufacturing research and development, and the role it plays in production, showed this area up as a veritable "coat of many colors." One thing is certain: More and more companies are recognizing the need for formal MRD programs. But perhaps it is time for some standardization of approach and it most certainly is time to improve communication—both within the organization and between development groups.

Approaches range from a confining *centralization* to a far-flung, and perhaps inefficient, *decentralization*. In some companies MRD works closely with design engineering right from the concept of a new product. In other companies development is largely an on-the-floor operation. The trend is toward better integration between design and manufacturing, with more familiarity at the design stage of a new product. But, should MRD work *ahead* of design?

The engineer needed for this work will be the general man, with just a touch of the artist in him, who can understand the problems of all phases and who will integrate them.

Whether or not the project is a rush one, it is advantageous for the contractor to shorten lead time, because he will be in a position to take on more work sooner and because a saving in time is a saving in money (within reasonable limits). One of the best ways to shorten lead time is to overlap the phases from the drawing board to production. Tooling, as well as manufacturing development, people get into the act while the product is being designed. Tooling is ordered, and at least started, on advance engineering releases. This is a gamble and causes some waste, but the saving in time is considered worth it.

Another way to shorten lead time is to eliminate the model shop phase. Build the prototype on the manufacturing floor, using the same people who will be building the production model.

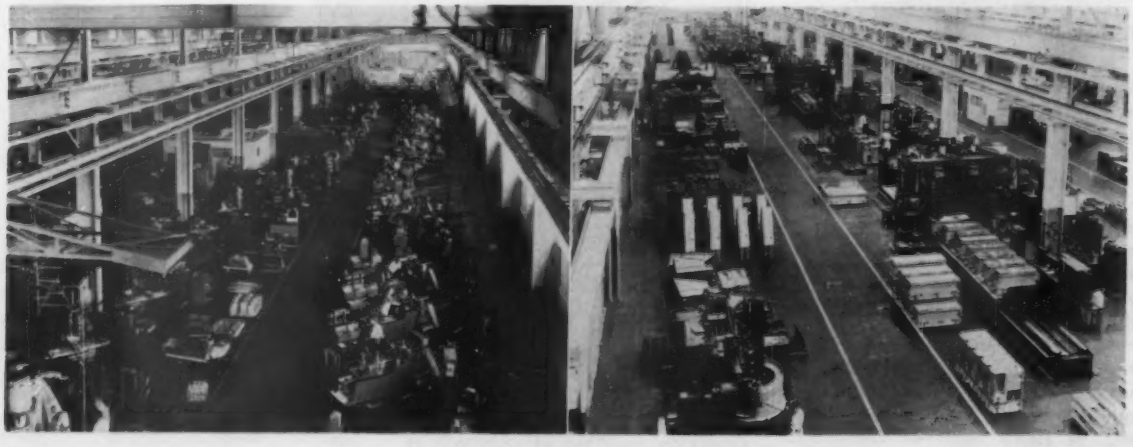
Cross Co Opens All-New Automation Equipment Plant

DETROIT—What may be the first all-new facility in the country for the production of automation machinery opened last week. The new $6 million factory and office building of The Cross Co is located on a 67-acre plot in Fraser, Mich.

Capacity of the new plant now is $15 million annually and there is floor space available to increase this to $25 million, according to Milton O Cross, Jr, president.

Simulated line production is provided by the layout with some duplication of equipment to avoid back tracking of materials. Heavy, medium, and light machining lines are housed in three bays, each 60 x 700 ft.

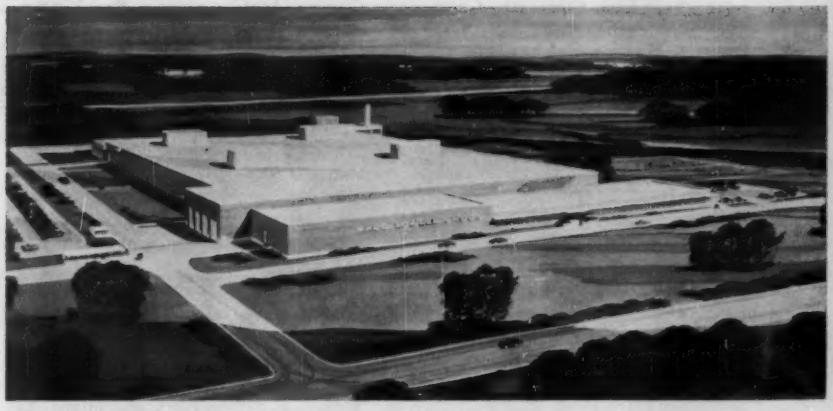
A data-processing department, equipped with a Univac computer, calculates and records the entire payroll, keeps records on bond purchases, finds mistakes between payroll and cost records, distributes direct and indirect labor, provides weekly reports on past-due machine work, and individual machine loads, provides shortage reports for assembly, and progress reports on individual orders.



Cross Co's new $6-million Fraser, Mich, plant goes to work . . .

Said to be the first new facility in the U S solely devoted to production of automation machinery, The Cross Co's new plant and offices at Fraser, Mich, on Detroit's outskirts features simulated line production, and Univac data processing. Left: view of the light machining line, where material flows from the machines in foreground through stockroom and is shipped from extreme far end. Right: the heavy machinery line

Sleepy Carolina villages now resound to the roar of jet engines under test. Multi-million-dollar guided-missile plants are springing up in onetime Florida orange groves. Tennessee's cotton pickers now make the machines that have replaced them. Northern metalworking is Alabama-bound for the flourishing region around Muscle Shoals. And Atlanta's historic Peachtree Street today is the hub of a thriving auto manufacturing and assembly industry as . . .



Maine's Saco-Lowell sets up shop down South . . . in the heart of the textile industry at Greenville, S C. This 300,000-sq-ft plant, it's said, is only a third the size it will be someday

The Old South Takes on a New Look

ATLANTA—Taking its place in the highly-concentrated textile-mill area around Greenville, S C, is an impressive new manufacturing plant. It's looked upon as a weathervane for the Southeast's heretofore relatively insignificant metalworking industry.

Maine's Saco-Lowell is doing very little talking about its new plant, but industry sources, which seldom fall back on a Chamber-of-Commerce pitch, feel that Saco-Lowell will someday be the state's largest single employer. They contend privately that this 300,000 sq-ft plant is just about one-third the size it eventually will be.

Such plants as this, along with Magnavox Corp's operations at Greenville, and Jefferson City, Tenn, which employ some 3000 at full capacity; U S Pipe and Foundry's expansion in Alabama, and a score of other such rumblings in the industry, have Southeastern metalworking executives in high spirits.

Even a casual look at the machinery in Southeastern plants points up the fact that in this department of metalworking the area has been woefully behind. Southeastern plants have been suppliers of auxiliary equipment while Eastern Seaboard and New England builders supplied the machine tools. But now Southeasterners believe the pattern is changing. And they offer some convincing evidence.

The area's greatest obstacle in attracting metalworking has been its lack of skilled labor. Manufacturers no longer find this such a tremendous drawback, and other factors outweigh this one as points for consideration.

South Carolina is an excellent example of what a Southeastern state is doing to alleviate the skilled labor shortage, which the metalworking industry in particular looks upon as a disadvantage when considering a new location.

Building Metalworking Skills

The state-supported South Carolina Trade School is producing a hard core of skilled metalworking craftsmen from a predominantly agricultural workforce. The school has also been very cagey in obtaining necessary training equipment at bargain prices.

Such well-known manufacturers as Singer Sewing Machine are vocal in their praise of the work done by previously untrained employes in their plant at Anderson, SC. In fact, state development leaders attribute several firms' interest in state plant sites to Singer's kind words.

With Kohler spending $15-million on a plant at Spartanburg; General Electric's giant capacitor plant near Columbia adjoining two other electronic plants—Aero Box and Sangamo Electric; Lakeshore Industries settling down in a 27,516 sq-ft plant at Batesburg to build jet plane equipment, and assorted other metal working industries either interested in or sold on the state, South Carolinians feel that metalworking will be a major factor in their program of balancing that state's agriculture and industry.

Incidentally, during the last fiscal year the value of manufactured products made in South Carolina reached an all-time high of $2.8 billion, a gain of $378 million over the previous year. Compared with 1950, a short six years ago, the gain is over $1 billion.

Much the same feeling is evident in North Carolina, where state boosters point with pride to Westinghouse's meter plant at Raleigh, largest plant of its kind in the world. Westinghouse has also broken ground at Athens, Ga, for a 750,000 sq-ft transformer plant. General Electric's medium transformer plant at Rome is helping swell the Georgia total.

The International Resistance Co at Asheville and Boone, NC, Sprague Electric at West Jefferson, and Douglas Aircraft are just a few of the firms that have joined such old-line Tar Heel manufacturers as Cocker Machine and Foundry Co of Gastonia, suppliers of heavy textile machinery for more than 40 years. Saco-Lowell has been producing such textile machinery as combers at its Sanford plant since 1948. Whitin Machine Works' Charlotte shop work force has grown from three men in 1932 to somewhat more than 300 employees today.

Such home-grown industries as Dependable Machine Co, Greensboro; Ferguson Gear Co, Gastonia; and Burlington Engineering Co of Graham (packaging dyeing equipment) are a few North Carolina firms started on half a shoestring. Today they are thriving medium sized operations that look forward to growing along with southern industry.

For example, Turner Manufacturing Co at Statesville, NC, was organized in 1905 as the W E Turner Machine Shop for making molasses machinery and reworking boilers. Five or six workers were employed in one small building. The firm now produces sawmill and agricultural machinery, and its gross annual sales are over $2 million. Turner today is the nation's largest producer of peanut harvesting machinery.

In Tennessee, Sperry-Rand Corp's $25-million guided missile plant at Bristol; International Harvester's $30-million investment at Memphis for the manufacture of mechanical cotton pickers; Borg-Warner's $2.5-million automotive parts plant, and Murray-Ohio Mfg Co's $2-million bicycle plant at Lawrenceburg add substantially to Tennessee industry.

At Memphis, Ford Motor Co built well over 100,000 units last year. But Atlanta is the automotive capital of the South. In fact, Georgia has long ranked fifth in the nation in this department. In Atlanta, Ford Division is now spending about $14 million on an addition to its Atlanta assembly plant, which at top production can turn out over 400 units daily. Three General Motors plants—Buick, Oldsmobile, Pontiac (BOP), Chevrolet and Fisher Body—added nearly $35 million 1956 payrolls.

In 1956, average weekly earnings in Georgia were $5.96 above those for 1954. Expansion and the opening of new plants manufacturing electrical machinery and professional, scientific and controlling instruments were the principal reasons for the gain.

Lockheed's payroll last year poured $100 million into metropolitan Atlanta. Atlantic Steel Co, an Atlanta concern manufacturing steel and wire products, has just completed a $10-million merchant bar and rolling mill. While sheet-metal work in Georgia is primarily confined to firms employing fewer than 25 persons, these firms number about 75.

In Savannah, Steel Products Inc, employing about 500, and Great Dane Trailer Corp, a $3-million concern, are making transport tanks and trailers. At Fort Valley, the Blue Bird Body Co has nearly 500 men employed in the manufacture of commercial and school bus bodies.

The northeastern Alabama metalworking scene is dominated by Reynolds Metals. When that company's new $80-million facility at Sheffield is completed next year, Reynolds will have some $800-million invested in the area. Ford Motor Co's aluminum casting plant going up nearby has placed the largest order in the history of the aluminum industry with Reynolds.

Metalworking industries in Alabama, however, are concentrated primarily in the Birmingham area because of the location there of such giants as the Tennessee Coal and Iron Division of U S Steel, employing some 25,000; Republic Steel at Gadsden, and Woodward Iron Co.

Southern Precision Pattern Works of Birmingham will soon have the largest complete pattern shop in the nation, and Dorsey Trailers at Elba in southern Alabama has completed a $500,000 expansion program, adding 116,000 sq ft to its manufacturing space. Streed Products Corp will make alloy pipe at Gadsden.

Florida is dotted with small foundries and machine shops, with the majority centered in resort cities such as Miami, Orlando and St Petersburg. St Petersburg and Orlando have also become the focal points of Florida's electronics industry.

Pratt & Whitney, Minneapolis-Honeywell, General Electric and Glenn L Martin are the nucleus of Florida's fast-growing guided missile, aircraft engine and electronics industries. Not only do these huge operations (Martin, for instance, is building a $7.5-million addition to its Orange County, Fla, missile facility) themselves swell the total of Florida metalworking operations, they are attracting many smaller subcontracting firms to the vicinity.

Maybe Nuclear Welding Jobs Aren't So Tough After All

PHILADELPHIA — Recent studies have taken some of the scare out of the subject of nuclear welding applications. In fact, some researchers have reached the conclusion that the problems differ in kind rather than degree from the problems encountered in normal welding.

Westinghouse has found that nuclear bombardment has less effect on the quality of weld than does the encumberance of the welder by his protective clothing, and the psychological effects of the presence of irradiation. This was one of the results of tests made in preparation for the refueling of the USS Nautilus, a project that would require cutting through the radioactive pressure vessel closure weld, refueling, and then re-welding—on material that had been subjected to irradiation for approximately 2½ years. They actually found no relationship between welding defects and prior irradiation, and further determined that prior irradiation to the degree experienced in this application did not affect the weldability of ASTM A212, Grade B, pressure-vessel material.

However, other technical papers presented here at the National Welding Conference at the Hotel Sheraton, April 8-12, indicate that, even if the irradiation factor is completely ignored, the remaining mechanical factors are enough to raise serious problems in welding for nuclear applications. Thicknesses from 7 to 9 in. are not unusual, many of them in stainless steels or in cladded low-alloy steels to avoid corrosion and contaminants which would become radioactive in service. No crevices must be left which would allow stress corrosion, and the extremely close tolerances on pressure vessels require careful machining, careful welding, and specific heat treatments for stability.

At the concurrent Welding Show, exhibited equipment was designed to make better welds with less effort, and to make operation trouble-free. More automatic welding equipment turned up this year at the Show than ever before—machines that require less attention and eliminate operator "rule of thumb."

Materials handling devices shown were designed to take the bull-labor aspects out of welding. One machine, for instance, moved the tool across the work, controlled only by an arrow-knob on a 360° dial. Operator simply turns the arrow so many degrees to the right, so many to the left, etc, and the tool follows.

Midwest...

Around the Midwest . . .

Link-Belt Co is building a new $5 million bearing plant in Indianapolis; it'll replace and increase by 50% the present Dodge bearing plant's capacity. Construction, on a 70-acre site, will be completed next year; initial employment of 600 will expand gradually to about 1000 . . . **Link-Belt Speeder Corp,** subsidiary, has expanded its Cedar Rapids, Iowa, plant; output of power cranes and shovels will be increased by 40% . . . **L A Young Spring & Wire Corp,** Detroit, has license rights to manufacture and sell Neg'ator constant-force springs formerly made by **Eastern Metals Research Co,** New York. Company plans to concentrate on high volume automotive applications . . . New entry in the vacuum melting field is **Vaculloy Corp** of Wooster, Ohio; it's currently engaged in custom work on titanium, steel, and other alloys, using its own process of the consumable electrode double melting technique . . . **Chrysler Corp** has a $3.5 million contract to furnish spare parts for WW II-type Dodge military vehicles previously turned over to Military Defense Aid Program countries by the US . . . **General Motors'** Euclid Division has started construction of its new 600,000-sq-ft plant for production of 80,000-lb tractor crawlers in Hudson, Ohio. Tooling is expected to run about $3 million . . . **Rockwell Manufacturing Co,** Pittsburgh, has taken over **Republic Flow Meters Co,** Chicago manufacturer of electronic and pneumatic instruments and process control equipment; this brings total number of Rockwell manufacturing plants to 23 . . . **Westinghouse Electric,** Pittsburgh, has $4,856,400 worth of orders from the New York City Transit Authority for subway power equipment . . . **Admiral Corp** has shut down its Bloomington, Ill, plant. Facility made radio and radar components for the armed forces, but contracts fell from $53 million in '53 to $14 million last year . . . Short course in shaped diamond tool technology will be held at Illinois Institute of Technology in Chicago, June 10-21. Class, limited to 25, will study techniques of making and using shaped diamond tools . . . **Nylok Corp,** Paramus, NJ, has licensed **Lamson & Sessions Co** to produce its line of self-locking screws and bolts. **L&S** will start production in its main Cleveland, Ohio, plant . . . **Automatic Transportation Co,** Chicago subsidiary of **Yale & Towne Manufacturing Co,** will increase its plant size 20%, production capacity 50% through $1.5 million expansion program scheduled for fall completion . . . **Peer, Inc,** Benton Harbor, Mich, maker of heavy-duty, automatic resistance welding equipment, has bought all assets of **Rex Welder Co,** Kansas City, Mo. Acquisition doubles **Peer's** production facilities, and equipment will be marketed under both brand names . . . **Ekco Products Co,** Chicago, has bought **Worley & Co,** Pico, Calif, maker of steel lockers and shelving . . . **International Harvester** employment in manufacturing and raw materials operations rose for the fifth consecutive month. March 1 total was 53,580; more than 1700 were added during February—biggest gains were at farm machinery plants.

South...

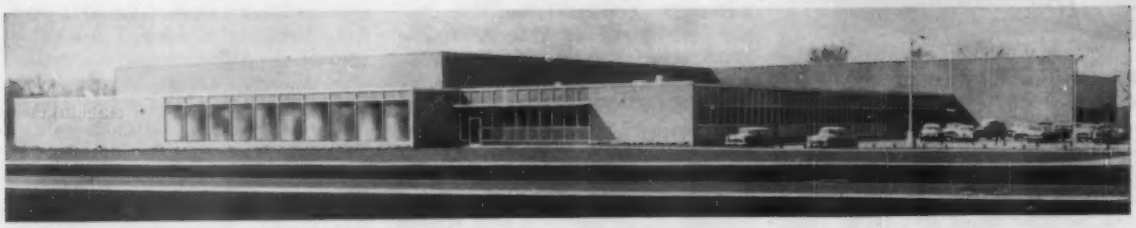
Southern shots . . .

Martin Co's new plant at Orlando, Fla, will be ready for October occupancy. Manufacturing space will take up 290,000 sq ft of the 6777-acre site. Company is deep in manufacture of the Lacrosse surface-to-surface guided missile; first delivery was recently made to the Army from interim manufacturing facilities . . . **Lockheed Aircraft's** Marietta, Ga, Division, which last year accounted for nearly 29% of firm's total sales, has just got its first strictly commercial contract. The $800,000 order covers large amount of tooling on the new Fairchild F27 propjet transport to be built by **Fairchild Aircraft Division** at Hagerstown, Md . . . **Container Corp** expects its multi-million-dollar food container plant at Brewton, Ala, to be in business by midsummer . . . **Sperry-Rand** has bought an 80-acre site at Oldsmar, Fla, for a $2 million electronics plant to be built by year's end . . . **Republic Steel** will build a 25,000-sq-ft facility at Charlotte, NC, for production of riveted corrugated metal drainage products . . . **Southeastern Loom & Machine Works,** has moved from Greenville, SC, to a new 138,000-sq-ft plant in Greenwood . . . **Yale & Towne Manufacturing Co** has taken over patents, machinery, and

NATCO Expands Its Richmond, Ind, plant 30% . . .

Another stage in its large-scale plant expansion program has been completed by National Automatic Tool Co Inc at its Richmond, Ind, plant, jumping its machine tool manufacturing space there by 30% and bringing total Richmond floor space to 342,000 sq ft. More machine tools have been purchased, too, to shorten critical delivery dates for NATCO machines, according to N M Forsythe, vice president and general manager. The new 75 ft x 530-ft building has standard highbay flat construction. Two cranes provide up to 30 tons capacity and are used with an electronic crane scale

FIELD REPORT



Machine Tool "Distribution Center" for Detroit

This is the new home of the 73-year-old Detroit machine tool and metalworking equipment distributing firm of Charles A Strelinger Co at 31855 Van Dyke Ave in suburban Warren, Mich. The one-floor, 93,000-sq-ft facility includes a spacious showroom for displaying tools and equipment under power, and extensive warehousing facilities. An elaborate intercom system allows a quick check on availability of stock items, while control of inventory is divisionalized for quick service. Also featured: a 100-ft service counter, a big parking space, enclosed truck wells to expedite loading and unloading, modern steel bins and shelving throughout

other tools, plus inventories and business of **Thomson Hardware Division** of the **Standard-Thomson Corp.** It'll transfer manufacturing operations from Vandalia, Ohio, to **Yale Lock & Hardware Division's** plant at Salem, Va. When full production gets going at Salem, employees will be upped by 20% . . . **Yale & Towne** is putting up a 55,000-sq-ft plant at Monroe, NC, its fourth in the South . . . **American Machine & Research Corp,** Inglewood, Calif, will construct a half-million-dollar diesel engine plant "somewhere" on Florida's east coast . . . **Joseph L Rozier Machinery Co** of Orlando, Fla, has completed expansion that doubles its repair and reconditioning facilities . . . **Trailmobile, Inc,** has broken ground for its $400,000 service facility in Atlanta . . . **Sperry-Rand Corp** is putting up a 150,000-sq-ft plant near Bristol, Tenn. Facility will turn out additional requirements for Naval ordnance systems, air navigation equipment, and missile system equipment developed and now being manufactured by **Ford Instrument Co Division.** Company employment needs are around 1200.

East...

Eastern briefs . . .

Ellicott Machine Corp, Baltimore, has acquired **McConway & Torley Corp** of Pittsburgh and that company's subsidiary, **Baltimore Foundry & Machine Corp.** Combined sales last year totaled $10,998,500 . . . **New York Shipbuilding Co,** Camden, NJ, has been awarded a $49,123,500 contract by the Navy to build 3 guided-missile destroyers. Actual work will start in about 9 months, and ships should be completed early in 1961 . . . **Consolidated Diesel Electric Corp,** Stamford, Conn, has acquired the business and assets of **Lima Electric Motor Co,** Lima, Ohio. It'll be operated as a wholly owned Con Diesel subsidiary . . . **Loewy-Hydropress Div** of **Baldwin-Lima-Hamilton Corp,** NY, has been awarded a multi-million dollar contract to design, build, and install cold structural shears, inspection beds, and a roller-table system for **US Steel Corp's** new structural mill at South Works, Chicago . . . **Foxboro Co,** instruments, will erect a $1.8 million manufacturing and office building in Foxboro, Mass, within the next year. Simultaneously, the company will build a $900,000 facility in England . . . **Elco Corp,** Philadelphia producer of socket tube shields and connectors for electronics industry, will spend $100,000 for new tools and machinery. Company reports that sales are up 24% over a year ago . . . Expansion program at the **Friez Instrument Div** of **Bendix Aviation Corp** will add 66,000 sq ft to the present 100,000-sq-ft plant. Increased space will include engineering offices, laboratories, and precision instrument test facilities . . . **Columbia Steel & Shafting Co** has purchased property and a plant building at Scottdale, Penna, where it will make cold-drawn stainless steel as a part of its **Summerill Tubing Div** at Carnegie.

West...

Western roundup . . .

Production has started at **Yale & Towne's** new $2.5 million materials handling plant at San Leandro, Calif. In addition to fork lift trucks, facility will turn out bulk handling equipment . . . **Rohr Aircraft** of Chula Vista received $37 million in orders in February, mainly for power packages for commercial airliners. Contracts (record for a single month) boosted backlog to an all-time high of $242,583,800; employment is at a peacetime high, and more workers will be added . . . Commercial machinery and defense products were fastest growing areas of **Food Machinery & Chemical Corp's** (San Jose) business last year. Machinery turned out in '56 added up to $112.8 million, 21% over '55. Defense business was $53.2 million, 18% above previous year. Chemical sales were up only 8% . . . **Pico Precision Products,** Pico, Calif, maker of specialized tooling and testing equipment for the electronics, aircraft, and guided missile industries, is now operating as a subsidiary of **Pendleton Tool Industries,** Los Angeles . . . Negotiations are going on for merger of **Kwikset Locks, Inc,** Anaheim, Calif, manufacturer of locksets, and **American Hardware Corp** of New Britain, Conn . . . **Zero Manufacturing Co,** Burbank, has taken over **Pacific Precision Tool & Die Co,** San Fernando Valley. **Zero** plans to turn out special military combination cases used to transport military equipment, wants to be sure of adequate die-making facilities . . . Production work on **Lockheed's** Electra transport is ahead of schedule, which calls for December completion of the first plane. Fuselage assembly operations have started at the main Burbank facility; volume production of sub-assemblies is underway in a new 68,000-sq-ft building at the Bakersfield plant . . . **Fuller Co,** Catasauqua, Penna, subsidiary of **General American Transportation Corp,** has opened a new $1.5 million plant at Compton, Calif. It'll turn out blowers, pumps, and compressors.

Arthur T West (left), secretary-treasurer of National Tool Co, has been elected president. **R D Lindstrom,** vice president, manufacturing, has been named vice president and general manager

Carleton Ellis, Jr, has been elected president and chief executive officer of Cavitron Equipment Corp. He was formerly director of sales for the Barrett Division of Allied Chemical & Dye Corp

Names in the News . . .

M Nielsen, executive vice president of Babcock & Wilcox Co, has been elected president to succeed **Alfred Iddles,** who is retiring.

John C Virden, president of Eaton Manufacturing Co, has been named, in addition, chairman of the board following the retirement of **Howard J McGinn,** associated with the company for 45 years.

William J Fath has been promoted to works manager of Hydraulic Press Mfg Co. **Warren E Beck** succeeds Mr Fath as production control manager, and **A L Wallace** takes over Mr Beck's former duties as assistant production control manager.

Henry R Merrill, general sales manager of Behr-Manning Co, Troy, NY, division of Norton Co, has been appointed vice president, sales.

Vincent P Masi has been named manufacturing manager of Chrysler Corp's Mound Road Engine Plant, and **Howard H Schrock** manufacturing manager at the company's Trenton Engine Plant.

Robert L Hamilton has been elected 1957-58 president of the American Supply & Machinery Manufacturers' Association. **Lyman H Bellows** and **Fred C Emerson** have been named first and second vice presidents, respectively; **Frank J O'Laughlin** is new secretary, and **Paul A Johnson, Jr,** treasurer. Elected members of the executive committee: **Stephen H Cross, W E Tromanhauser, George H Woodland, Robert V Yohe.**

A J Williamson, executive vice president of Tube Reducing Corp, has been elected president.

Raymond C Bullard, advertising manager of Bullard Co since 1927, and grandson of the founder of the company, has resigned from his post because of ill health. **William C Neu,** assistant advertising manager, succeeds him.

Merle W McLaughlin has been appointed vice president, manufacturing, of Copeland Refrigeration Corp, Sidney, Ohio. Prior to joining the company he was general manager of the Traverse City, Mich, division of the F L Jacobs Co, manufacturer of automotive parts.

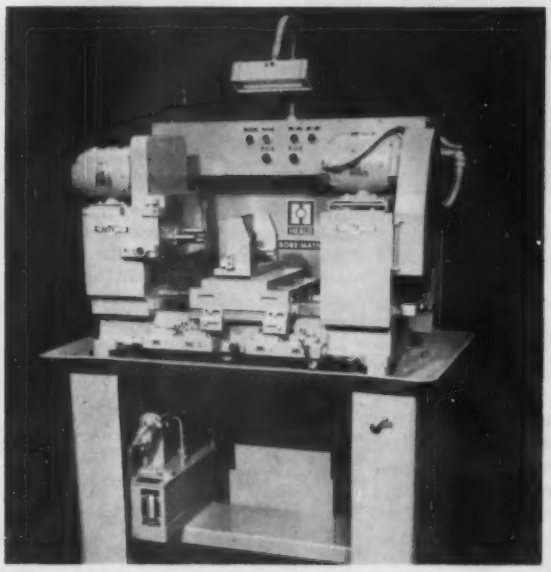
Malvern J Mather, executive vice president of the Allen Manufacturing Co, Hartford, Conn, socket screw concern, has been made president of the company. He succeeds **James G Osmond,** who has retired. **Ellsworth S Grant,** associated with the company since 1940, has been named vice president, manufacturing.

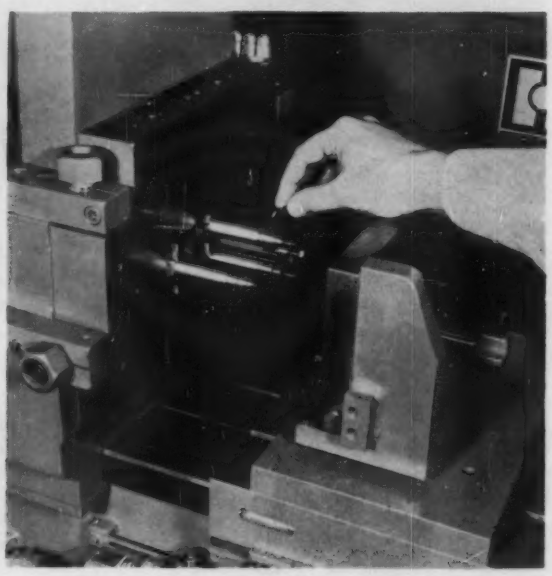
Bruce M Regan, manufacturing manager of Snyder Tool & Engineering Co, has been appointed vice president, manufacturing

John J Fajnor has been elected a vice president of Brad Foote Gear Works. He was formerly plant manager of American Gear & Manufacturing Co, the company's Lemont, Ill, division

Horace W Whitman has been promoted from assistant to general manager of Torrington Manufacturing Co's Machine Division

New Shop Equipment





Heald Precision Boring Mill Features Modular Design

The Model 0 Bore-Matic—a unitized precision boring machine—can be set up as a dozen different basic machines with hundreds of combinations in standard tooling and fixture equipment. Work that can be done on the machine includes straight and taper boring, straight and taper turning, facing, chamfering, grooving diameters and faces, reaming—and, with special attachments, contour or spherical boring or turning and slot milling—singly or in any combination. Either the work or the tools can be rotated, and many different operations can be performed simultaneously or in sequence on one or more workpieces.

Standard Tooling

Standard tooling available with the Model 0 includes a selection of interchangeable boringhead and drive units and manual or hydraulic cross-slide attachments.

Multi-Spindle boringheads, with interchangeable front plates, can be arranged in any combination on center distances as close as ¾ in. A cross-slide is used to obtain center distances closer than ¾ in. by indexing to another cluster on the same plate. Heads are driven by a single timing belt from motor mounted on top of the head unit. Assembly consists of a heavy cast iron supporting frame arranged to mount a spindle plate which is precision bored to receive the required number of spindles in any desired position. A variety of spindles, ranging from the ¾-in. miniature size up to 3½ in., can be used in combination.

Spindle plates are interchangeable. A single plate can be bored to a specific head setup for each multiple-hole boring job. When the holes do not overlap, one plate can be used for several different jobs by mounting the heads only in the spindle-plate holes required for each job and leaving the others empty. Boringhead and drive units mount on either end of baseways, keyed between ways and clamped with hold-downs. Heads are belt driven and arranged for four-speed operation by stepped sheaves on motor and boringhead.

Hydraulic cross feed units, complete with hydraulic operating cylinders and controls, are available for both the standard and multi-spindle boringheads. They permit grooving and facing operations to be performed with rotating tools. Air cylinders can also be supplied to operate chucks and arbors for holding rotating work.

Swivel boringhead support, for single boringhead units, can be turned 10° on either side of center line. This permits taper boring and turning of rotating work. Hydraulic and manual cross-slides permit precision horizontal indexing of work or tooling for multiple-hole boring and for generating faces, grooving and undercutting of rotating work.

Universal fixture consists of manually operated vertical work-slide mounted on cross-slide or table. It provides accurate horizontal or vertical indexing for multiple boring without rechucking the work. The coolant pump and tank is a completely self-contained unit consisting of coolant reservoir and circulating pump mounted adjacent to the machine base. Basic machine is mounted in a large, flanged chip pan, and the coolant pump and tank can be added for wet operations.

Basic Machine

The simplest machine consists of a precision-built base-way unit with hardened and ground pressure-lubricated box-type ways, hydraulically operated table, rigid cast-iron base, hydraulic power unit, and all neces-

Materials and Parts . . .

sary controls. Table is operated, through rack and pinion, by a hydraulic cylinder at rear of machine where heat from the hydraulic fluid will not affect the machine's operation. The Model 0, though smaller than company's earlier Bore-Matics, will reportedly hold tolerances of 0.0002 in. or better on regular production work and is said to be able to do anything within its capacity range that a larger Bore-Matic can do.

Capacity

Capacity on the Model 0, as measured from top of table to center line of spindle is 5 in. with the table and 4 in. with the cross-slide. Distance between heads on a two-head unit is 5 in.; maximum table travel is 9 in. and maximum cross-slide travel is 5 in. Feed ranges from 0.5 to 50 ipm, and rapid traverse rate is 15 fpm. Variations in center distances and heights can be specified where needed.

Other Features

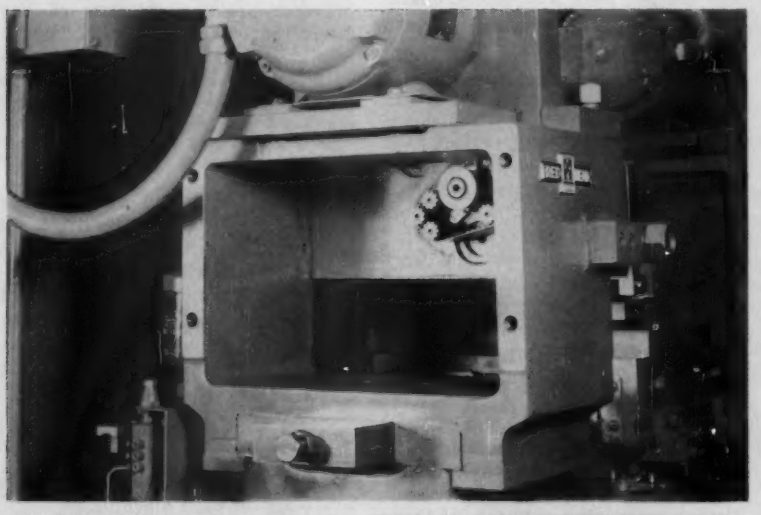
- Interchangeability of units permits work started on one machine to be shifted to another by moving unit head and fixtures along with the work. A subcontractor equipped with the basic machine could take over a job as soon as he receives the unit head and necessary fixtures to mount on his machine.
- Machine uses cartridge-type spindles.
- Multiple boring operations no longer would require highly skilled operators.
- Interchangeability saves users time and money in inventories of components, adapters, and similar tooling.

General Specifications

Floor space with separate cutting-fluid tank is 52⅝ x 48 in.; without tank, 35 15/16 x 48 in. The capacity of the cutting-fluid tank is 17½ gal, the capacity of the oil system is 4½ gal, and the net weight of the machine with average tooling is approximately 1680 lb. Motors for both the oil pump and the cutting-fluid unit are ¼ hp, 1800 rpm; the standard motor for the head drive is 56 frame, ½ hp, 1650 rpm.

Although the unit is normally furnished on a steel cabinet containing the hydraulic power unit and mounting the electrical control panel, it can also be supplied as a bench-type machine for mounting on any support of suitable strength and rigidity. Hydraulic power unit and control panel can be separately mounted.

Heald Machine Co, Worcester 6, Mass.



Each Multi-Spindle boringhead is a precision unit complete with spindle, bearings, cylindrical housing drive pulley, and provision for attaching the required tooling

...including

MACHINE TOOLS AND ATTACHMENTS

Automatic Screw Machine 182
Vertical Production Lathe 183
Pneumatic Tapping Head 183
Multi-Spindle Microhoner 184
Power Saw 184
Boring and Milling Machine 188
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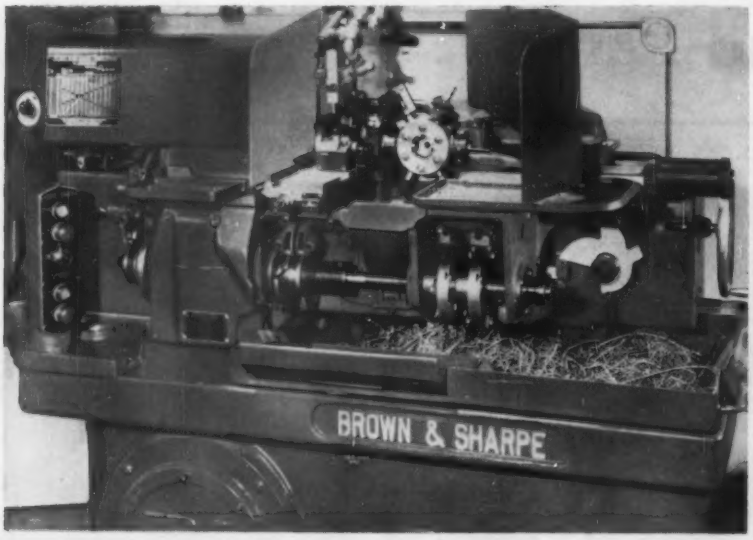


Redesigned B & S Automatic Cuts Wide Range of Materials

The B & S No. 2 Automatic, latest in company's line of automatics, is said to be faster and more efficient —with higher sustained accuracy and reduced maintenance. Over-all production increases ranging up to 33 1/3% have been achieved. Available in three capacities, machine will take ¾, 1¼, or 1½-in.-dia stock. For turning, forming, and one-chip finishing to 2½-in. length (3½ in. with lower driveshaft speed), the No. 2 consistently holds limits to 0.0005 in.

A wide range of 18 high spindle speeds is available, with a top speed of 5050 rpm on the ¾-in.-capacity spindle, 3500 rpm on the 1¼ in., and 2450 rpm on the 1½-in. spindle. For each high speed, 11 or 12 low speeds can be used in combination, in ratios from 2.2:1 up to 15:1. This wide choice of high and low speed combinations permits high cutting efficiency on materials ranging from tough steels to brass and plastics.

Removable spindle controls end and radial play on new automatic. It permits work to be consistently held to limits of 0.0005 in. with fine finish

Easier, Faster Setups

Rapid setup of the machine for speed and direction of spindle rotation is achieved by means of only 18 change gears. All selections are made by simple pick-off gears located in a single compartment. Driving chains and sprockets remain untouched. Eleven change gears produce a wide range of productive capacities from 1-2/3 sec per part to 480 sec per part. For second-operation work it is only necessary to turn a screw that lowers a shoe on the chuck trip lever.

High Production Features

Mechanisms for feeding stock and indexing the turret are driven from a constant-speed shaft (either 240 or 120 rpm), and complete their respective functions in ½ sec when using 240-rpm driveshaft speed and in 1 sec at 120 rpm regardless of spindle speed or production rate. The swing stop for stock, independent of turret, is operated in conjunction with feeding mechanism and requires no extra time.

Vertical slide has a quick-acting tool clamp which frees a cross-slide for additional tooling. Double indexing of turret is another time-saver. On jobs requiring only two or three turret tools, one set of tools can be used (in alternate holes) and two positions indexed in the same time required for single indexing.

Positive stopping device can be set to stop the driveshaft automatically when last piece in the bar is completed, a warning light showing when the machine is not producing.

Deep drilling operations are speeded by another standard item, the rapid-pull-out mechanism. This device increases production whenever it is desired to withdraw the drill several times to clear the hole. Drill is withdrawn and returned to drilling position in ½ sec. A cam, special for each job, added to end of camshaft operates the mechanism that causes turret to withdraw and return without indexing.

Removable Unit Spindle

Spindle is of unit construction, and may be readily removed if necessary. The higher-speed, ¾-in.-capacity spindle has ball bearings throughout, while the larger-capacity units are mounted on roller bearings with end thrust taken by preloaded ball bearings. Threads inside the sprockets, for clutch adjustment, have been eliminated and frequency of adjustment has been reduced to minimum.

Maintenance and Safety

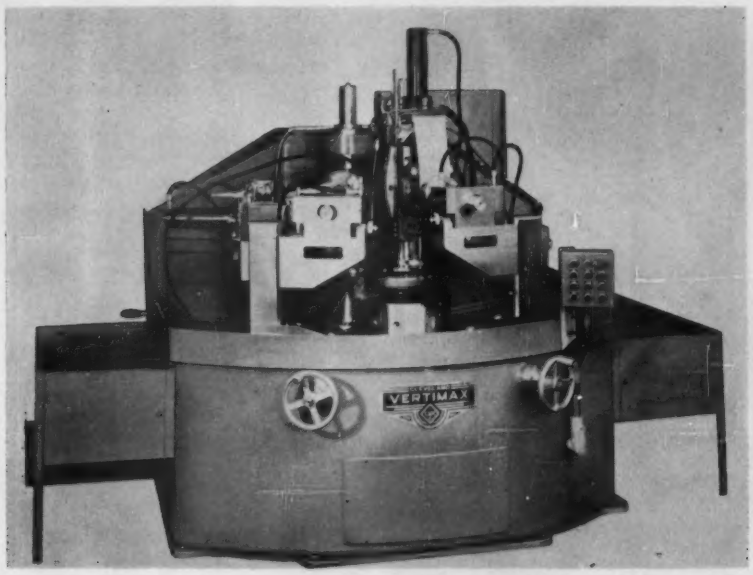
Minimum maintenance is assured by automatic lubrication and numerous safety devices. Spindle driving gears, sprockets, and chains are lubricated by splash from lubricating-oil reservoir. Other points are lubricated by direct lines from a distributing pump. A spring safety device in the stock feeding mechanism prevents breakage in case of any interference with the advance of the feed tube. If the toolslide mechanisms are subjected to excessive stress, power to driveshaft is automatically shut off.

Control Panel

Panel has start and stop buttons for main motor or spindle drive. In addition there are start-stop buttons for the electric clutch and a jog button which permits small-increment movements when setting up. Adjacent to the electric clutch is a solenoid-actuated brake. As soon as clutch is de-energized, brake stops driveshaft. It offers no drag or opposition to handwheel rotation of driveshaft.

A complete line of accessories is available for each machine.

Brown & Sharpe Mfg Co, Providence, RI



Toolslides Supported at Both Ends In Vertical Production Lathe

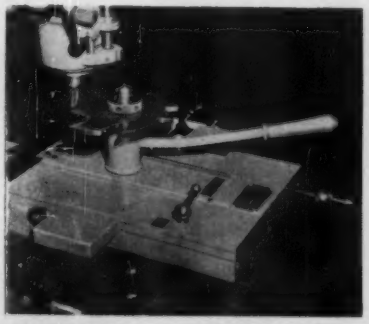
The Cleveland Vertimax, new vertical production lathe, has eliminated the cantilever or overhung-type support for the toolslides, and uses toolslides that are supported at both ends, providing max rigidity against cutting forces. Toolslides are positioned by means of calibrated eccentrics. This "closed-circuit" support provides rigidity for extremely heavy and interrupted cuts in a machine of compact dimensions (shown here with guards removed).

Toolslides can be swiveled from below horizontal to beyond the vertical position, making possible besides normal turning and boring operations simultaneous machining of two internal, two external, or an internal and an external taper. Toolslides are cycled automatically by hydraulic controls employing a differential feed system which also senses unusual load conditions such as excess stock or broken tools and through a pressure-sensitive control will automatically return the toolslides.

The machine has many features. Automatic, rapid tool approach, and automatic tool relief on return stroke are standard features. Tool slides can be operated simultaneously, or in any desired sequence; depth of feed and slide control are controlled by positive stop; motor to countershaft drive is by V-belts, countershaft to spindle drive is by chain; variable-speed motor and control maintain constant cutting speed at cutting tool.

Vertimax machines are available completely automated—complete automatic loading and unloading, semi-automatic loading and unloading, size controls, additional toolslides, hydraulic profiling. Larger sizes, multiple spindle, and special designs can be built to order. Catalog available.

Cleveland Hobbing Machine Co, 1311 Chardon Rd, Cleveland 17, Ohio



Precision Cam Generator Makes Plate Cams for Any Machine

Gen-A-Cam, used with either a milling machine or surface grinder, makes accurate and constant rises on all plate cams. It will reportedly alter hardened cams within minutes during setup, and restore soft cams that have worn from heavy pressure of rollers.

Manufacturer states that machine will generate lobes of any size and can generate two or more rates of rise on any one lobe, permitting two or more rates of feed for any tool. Unit operates without use of change gears. It is designed to assure absolute accuracy with an infinite selection of rates of rise from 0.000 (dwell) to 0.100-in. rise per hundredth of cam surface. Layout attachment is available which allows quick and accurate scribing of blanks.

Steuby Manufacturing Co, St Louis 13, Mo

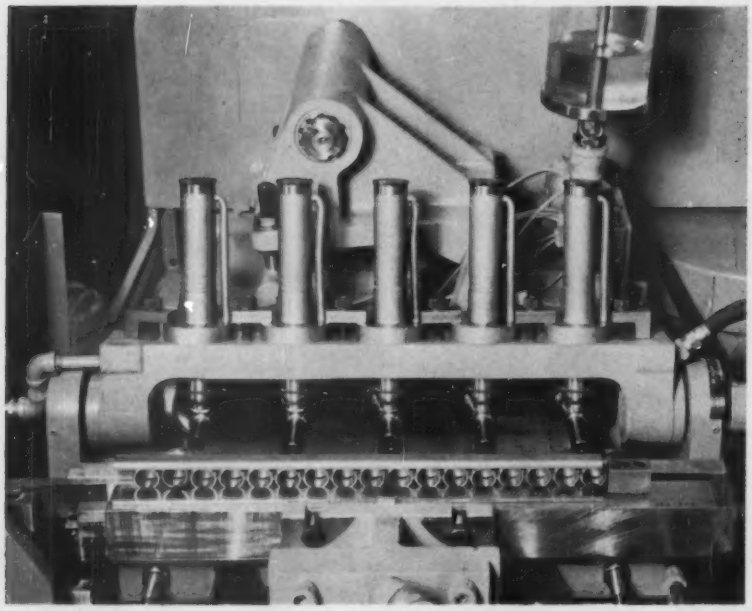
Commander Pneumatic Tapping Head Mounts on Any Drillpress

Called the Pneu-matic Tapper, air-actuated tapping head with adjustable torque control is a multi-purpose tool designed for production or precision tapping. Unit can be mounted on any drillpress. Automatic control of rapid approach, tapping, reversal, and withdrawal permits high-speed automatic or semi-automatic tapping.

Adjustable rate of spindle approach and tapping depth insures fast, accurate tapping. Cycle interruption switch returns tapper to top position immediately, regardless of position in the cycle when switch is thrown.

Tool handles taps between No. 0 and ¾-16. When desired, unit can be converted to leadscrew tapping by replacing the main-spindle drive assembly with a standard Commander leadscrew assembly. It operates on shop air pressure and 115v ac.

Commander Mfg Co, 4225 W Kinzie St, Chicago, Ill



Automatic Multi-Spindle Machine Microhones Bearing Raceways

Both inner and outer raceways for ball bearings are now being microhoned on a new line of multiple spindle machines. The Micromatic units are designed with either 3 or 5 spindles, depending on bearing size. Entire operation is automated, including automatic loading and ejection, automatic cycling, and feeding of abrasives. Machine stops automatically when abrasives require replacing.

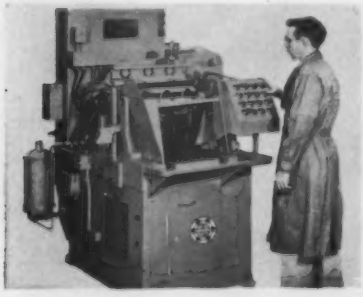
Tapered arbors are used for the small inner rings, and end-clamping arbors for the larger sizes. Parts are pressed on the arbor then pulled against a plate that locates them in relation to tools. Tools are mounted on an oscillating bridge that pivots about the true center of the raceway arc. As ring rotates, the abrasive sticks sweep across the tracks removing all irregularities and leaving a surface that is clean of smeared or deformed material.

During major portion of the timed cycle, the bridge oscillates rapidly to give full coverage of the raceway and remove stock rapidly. Speed of oscillation is then automatically reduced, so that finished track has all abrasive marks running circumferentially around the track.

Outer rings are held in chucks that locate them from the OD and clamp on the side faces. Motion and cycling are the same as on inner rings.

Production on a 5-spindle Microhoner, finishing No. 8 inner bearings is 500 rings per hr. Using 3 spindles for the outer rings of the same bearing, production is 240 parts per hr. This will vary with size of bearing and condition of the rings as they come to the machine.

Micromatic Hone Corp, 8100 Schoolcraft Ave, Detroit 38, Mich



Outer ring raceways are machined on this 3-spindle machine. Tool feed cylinders are below the bridge

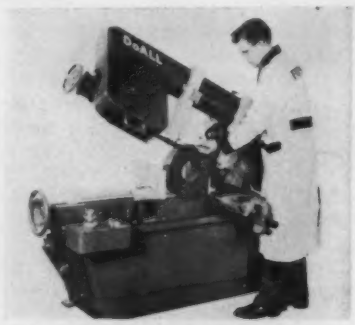
Plastic Material Is Tough Enough To Replace Metals for Many Uses

GE's new polycarbonate resin compound, Lexan, has an unusual chemical composition offering a combination of toughness and heat stability not previously available in thermoplastic materials. Parts made from Lexan are reportedly strong enough to withstand blows of a carpenter's hammer.

Lexan is now being made in small lots at GE's research lab at Pittsfield, and all available material is going into testing programs. Early studies indicate that the material can be made in a variety of transparent or opaque colors, with parts showing good surface hardness and gloss. Properties of the polymer suggest its use in such applications as coil forms, appliance parts, gears, structural parts, rollers, electronic components, and telephone accessories.

Physical properties include an impact strength of over 12 ft-lb per in. of notch, tensile yield strength of 8000 to 9000 psi, tensile ultimate strength of 9000 to 10,500 psi, and an indentation hardness of R_m 70. Low water absorption and 280 to 290 F heat distortion point minimize dimensional changes. Lexan shows excellent resistance to thermal-oxidative degradation at temperatures up to 300 F.

General Electric Co, Chemical Development Dept, 1 Plastics Ave, Pittsfield, Mass



DoAll Power Saw Cuts Pieces Up to 12-in. Square

Model C-12 power saw has a work capacity 12 x 12 in. in size and 1500 lb in weight and uses a saw band 1 in. wide and 129½ to 132½ in. long. Band is powered by 1½-hp motor through four step-cone pulleys giving blade speeds of 90, 125, 180, and 250 sfpm.

Accuracy of cut is 0.002 per in. of dia; typical cutting rates are under 2 min for a 5-in. round of mild steel, 5 min for 3½-in. square of 18-8 stainless, 19 min for 11¾-in. round of oil-hardened tool steel. A hydraulic system provides band tensioning and also controls the feed and raising of sawing head. Reservoir for recirculating coolant system is built into base of machine.

DoAll Co, Des Plaines, Ill

Mr. V. N. Agather, Vice President of Production at La Consolidada, S. A., Mexico, Manufacturers of Malla-Lac—Concrete Reinforcing Wire Mesh.

—he helped make it possible
with Sciaky Resistance Welding Techniques

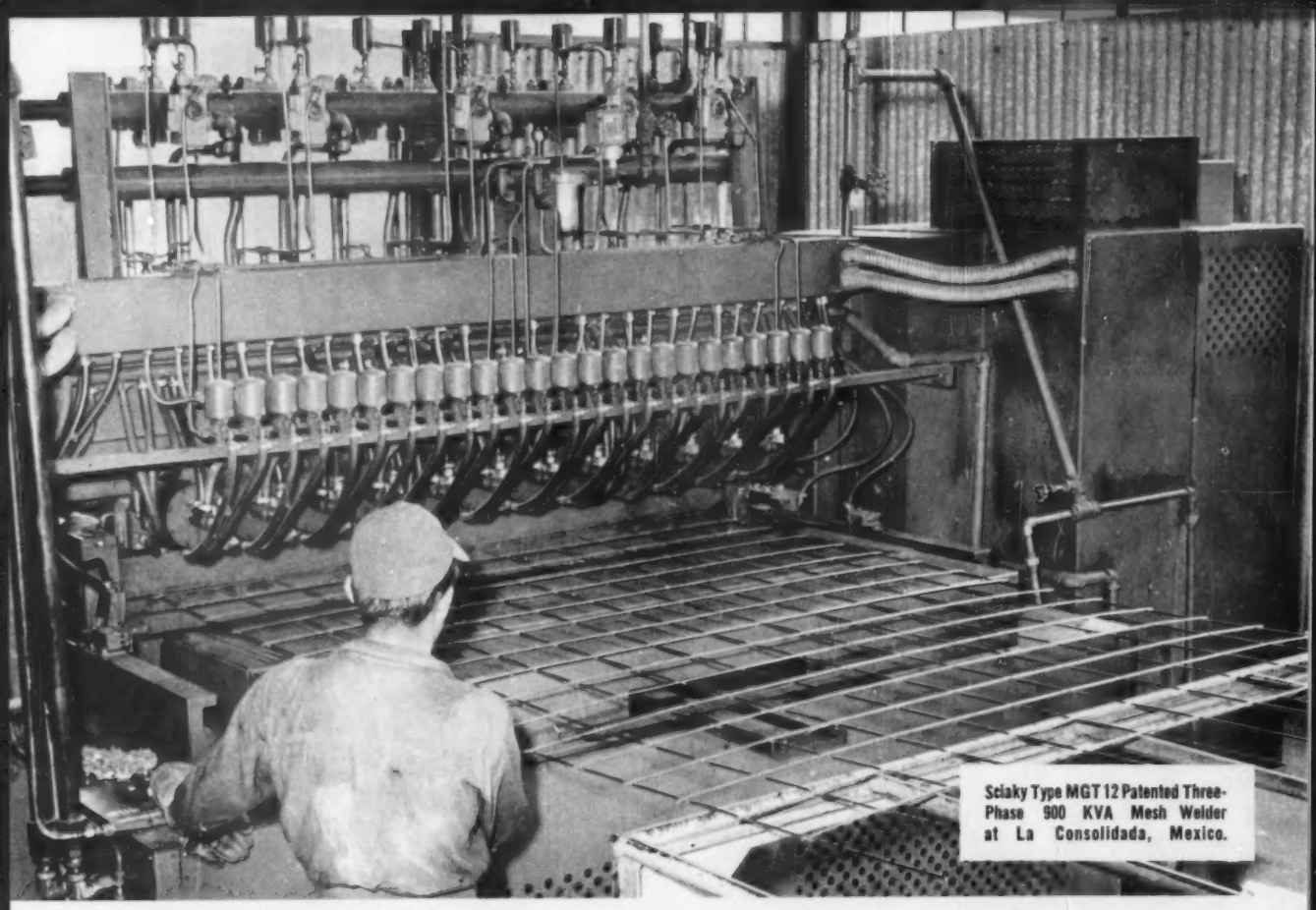
Not only are Mexican swimming pools made with La Consolidada concrete reinforcing wire mesh, but office buildings, commercial structures and private homes as well. Critical shortages of lumber and fabricated structural members in Mexico force the extensive use of reinforced concrete construction.

As the leading Mexican manufacturer of steel wire and wire products, industrial fasteners and merchant bar products, it was natural for La Consolidada to become the first to introduce resistance welded wire mesh for concrete reinforcing.

In their need for a production process that would satisfy their particular complex requirements, La Consolidada turned to Sciaky Resistance Welding Techniques exclusively. Because Sciaky Resistance Welding Techniques are designed to put the profits back into manufacturing! Turn the page for more information on how La Consolidada does it.

SCIAKY.

There are Sciaky plants in Chicago, Paris and London, as well as an Application Research Center in Los Angeles, California



Sciaky Type MGT 12 Patented Three-Phase 900 KVA Mesh Welder at La Consolidada, Mexico.

La Consolidada Offers 32% Savings in Steel to Building Construction with Concrete Reinforced Wire Mesh

***Sciaky Resistance Welding Techniques* used exclusively to introduce concrete reinforcing wire mesh to Mexico**

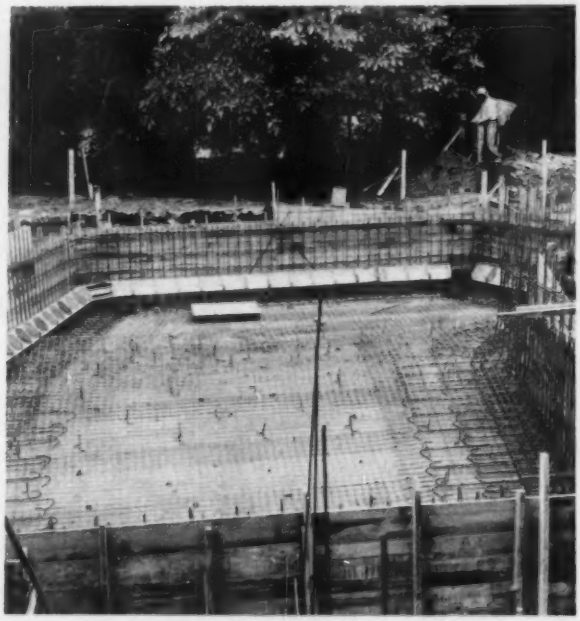
La Consolidada's wire mesh, called Malla-Lac, has received immediate, overwhelming acceptance and future production is already sold out. Much of this success is due to production methods and Sciaky equipment tailored to specific needs:

1. **Versatility to provide range of mesh and wire sizes.**
2. **Capacity to match needs.**
3. **Simplicity of operation and maintenance.**
4. **Dependability in heavy duty operation.**
5. **Lowest cost to put equipment in production.**
6. **Ability to get service in Mexico.**

Sciaky resistance welding techniques and equipment satisfy all of these requirements. It enables La Consolidada to sell Malla-Lac at a price competitive to reinforcing bar. It enables La Consolidada to produce a product of the quality necessary to building construction.

If *you* fasten metal products together to fabricate your products, take advantage of Sciaky Resistance Welding techniques—like La Consolidada does!

Further data is given in the publication "Resistance Welding At Work", Vol. 5, No. 2. Write for your copy.



La Consolidada Concrete Reinforcing Wire Mesh As Used In Construction of Swimming Pool.

Sciaky Bros., Inc., 4930 West 67th Street, Chicago 38, Ill., POrtsmouth 7-5600

SCIAKY

FYI

FOR YOUR INFORMATION

FREE Catalogs, Booklets, Charts, Calculators

FYI – these initials symbolize information that's important. And there is much of importance in the literature listed here. To get the ones you need, all you do is fill out one coupon for each booklet you wish to order. Indicate in the circle on the coupon the number of one catalog wanted. When you have filled out a card, detach, stamp, and mail. We'll do the rest.

MACHINES AND ATTACHMENTS

1 "COMPUTATIONS FOR METAL WORKING IN PRESSES"—*E W Bliss Co, 1375 Raff Rd, SW, Canton, Ohio.* 50-page illustrated bulletin 38 contains information and alignment diagrams for computing pressure and sustained work capacity of presses, as well as pressure and work requirements of the job press is to do. Includes data, formulas, and charts on blanking and shearing, drawing and reducing, ironing, coining, sizing, forging, and extrusion.

2 THREADING MACHINE — *Landis Machine Co, Waynesboro, Penna.* 8-page bulletin H-74 contains illustrated information on Model 5C, a single-spindle machine for precision threading of small-dia work. Design features, specifications, applications included.

3 GEAR HONING PROCESS—*National Broach & Machine Co, 5600 St Jean Ave, Detroit 13, Mich.* 4-page bulletin H-57-2 discusses Red Ring finishing process. Model GHB gear honing machine illustrated and described with specification tables for 8 and 12-in. units.

4 TURRET LATHE CONTOUR ATTACHMENTS — *Warner & Swasey Co, 5701 Carnegie Ave, Cleveland 3, Ohio.* 8-page illustrated bulletin 5702 gives design features and specifications of a cross-slide mounted turning and facing unit for the 2A, 3A, 4A, and No. 5 turret lathes; and a hex turret mounted boring unit for 3A and 4A machines, both with W&S "micro-sensitive" control system.

5 TANDEM GEAR HOBBER—*Michigan Tool Co, 7171 E McNichols Rd, Detroit 12, Mich.* 8-page bulletin TH-33 contains details on Model 1433. Covers design features, operation, automation adaptability, advantages, specifications.

6 CUTOFF MACHINE—*DoAll Co, Des Plaines, Ill.* 4-page brochure illustrates and describes the C-12 power saw, 12 x 12-in. capacity. Chart shows cutting rates and tool costs for machining of most carbon and alloy steels.

7 EXTRUSION PRESS — *Farrel-Birmingham Co, Inc, Watson-Stillman Press Division, Roselle, NJ.* 6-page illustrated bulletin 340-C gives data on aluminum extrusion presses. Construction and design features pictured and described.

8 HYYDRAULIC PRESS LUBRICATION—*Lake Erie Machinery Corp, 507 Woodward Ave, Buffalo 17, NY.* 16-page illustrated bulletin 155, "Hydraulic Oil Data & Lubrication Guide," as related to presses, deals with supervision of hydraulic systems, preventive maintenance, oil specifications, and guide lubrication.

TOOLS AND ACCESSORIES

9 TOOLS—*Fastest Tool Co, 7408 E Davison Ave, Detroit 12, Mich.* 36-page catalog contains descriptions, specifications, list prices on N-Mills, Woodruff keyseat cutters, center reamers, and combined drills and countersinks.

10 MAGNETIC CHUCKS — *Hanchett Magna-Lock Corp, 356 Maple St, Big Rapids, Mich.* 28-page catalog 257 illustrates and describes line of magnetic chucks, holding devices, and accessories. Booklet also contains table of constants.

11 PUNCHING AND NOTCHING UNITS—*Toolset, Inc, 1411 Military Rd, Buffalo 17, NY.* 72-page illustrated manual presents specifications, applications, prices, working data on line including vertical and horiontal units for normal, heavy, and extra-heavy duty work.

12 CARMET CARBIDE GRADES—*Allegheny Ludlum Corp, Carmet Division, 1500 Jarvis Ave, Detroit 20, Mich.* Series of 15 Blue Data Sheets cover grades for machining steel, non-ferrous and cast iron materials; die grades and wear uses; chrome carbide uses. Applications, analysis, physical characteristics included.

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SCIAKY.

Reader Service Department
American Machinist
330 W. 42nd St.
New York 36, N. Y.

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FYI — FOR YOUR INFORMATION

13 SUBLAND DRILLS—*Mohawk Tools, Inc, 910 E Main St, Montpelier, Ohio.* 4-page illustrated booklet discusses advantages of subland two-diameter drilling as opposed to step drill two diameter drilling. Maintenance requirements of both covered, as well as production records.

HEAT TREATING AND WELDING

14 RESISTANCE WELDERS—*Taylor-Winfield Corp, Warren, Ohio.* 10-page Special Machine bulletin S-413 has illustrated descriptions of 32 multi-spot and projection machines. End product, type of operation, production rate, and associated materials handling equipment listed for each.

15 HIGH-TEMP BRAZING ALLOYS—*Wall Colmonoy Corp, Stainless Processing Div, 19345 John R St, Detroit 3, Mich.* 4-page illustrated catalog SD-23 gives data on Nicrobraz group of alloys, and related materials of stainless, and special alloys. Characteristics, physical properties, applications included.

16 UNIVERSAL BALANCE POSITIONER—*Aronson Machine Co, Arcade, NY.* 16-page bulletin UB57 pictures and describes five models with capacities of 25 to 2000 lb. Includes schematic drawings, specifications, optional accessories.

PLANT SERVICE EQUIPMENT

17 AUTOMATIC SPRAY FINISH MACHINE — *DeVilbiss Co, Toledo 1, Ohio.* 12-page illustrated catalog covers transverse machines for four types. Models and specifications of horizontal and vertical straight line types included; contour machines (built to order) in both types are described.

18 ELECTRIC FORK TRUCKS—*Clark Equipment Co, Industrial Truck Division, Battle Creek, Mich.* 8-page brochure describes operational characteristics and mechanical details of line. Components and features illustrated and described.

19 ADJUSTABLE STORAGE RACKS —*Sturdi-Bilt Engineering Co, 2501 W Peterson Ave, Chicago 45, Ill.* Bulletin SR-956 contains specification chart, suggestions for uses, installation pictures. Illustrated bulletin BB-956 contains data on steel bulk bins, easily assembled and readjustable.

20 VACUUM CLEANING SYSTEMS —*US Hoffman Machinery Corp, 103 Fourth Ave, New York 3, NY.* 8-page brochure AA-100 describes stationary systems for dust removal. Details supplied on units and accessories.

21 ABRASIVE CHIPS AND MEDIA—*Macklin Co, Dept 70, Jackson, Mich.* Illustrated literature provides information on line of Tumbrade-40 chips and triangular media for mass-production barrel finishing of ferrous and nonferrous castings, forgings, and parts. Characteristics, specifications, advantages, applications covered.

PARTS AND MATERIALS

22 PRECISION STOCK GEARS—*Dynamic Gear Co, 29 Merrick Rd, Amityville, LI, NY.* 88-page indexed, spiral-bound catalog E-88 gives detailed information in tabular form, engineering data, tolerances, ordering information, describes available design kits.

23 PERMANENT MAGNETS—*General Electric Co, Magnetic Materials Section, Edmore, Mich.* 12-page catalog PM-121 covers both cast and sintered units. Includes information on magnetic and mechanical properties, approximate tolerances, magnet assemblies, engineering data.

24 POLY-V BELT DRIVES—*Raybestos-Manhattan, Inc, Manhattan Rubber Division, Passaic, NJ.* 112-page illustrated engineering data book No. 10 contains charts, tables, and diagrams, specifications for all drive sizes. Theory and application discussed. Comprehensive data on V-belt drives include drive tables, hp ratings, installation instructions.

25 SPLIT BEARINGS—*Split Ballbearing Corp, Lebanon, NH.* 25-page catalog 57 illustrates and describes high performance anti-friction bearings in which either the outer race only or both inner and outer races are fractured, or split. Design advantages discussed, engineering and selection data included.

26 AIR CONTROL VALVES—*Galland-Henning Nopak Division, Milwaukee 46, Wis.* 24-page illustrated catalog 105 covers Nopak-Matic poppet-type units in 2, 3, and 4-way types. Applications, dimensions, and installation data included.

27 HIGH-TEMP ALLOYS — *Carpenter Steel Co, 109 W Bern St, Reading, Penna.* 20-page booklet covers engineering properties and fabrication characteristics of ten high-strength alloys. Includes physical constants, mechanical properties at room and elevated temperatures, heat treatment, forging, cold working, welding and corrosion resistance.

28 FILTERS—*Industrial Filtration Co, Dept GB-257, Lebanon, Ind.* 8-page General Bulletin illustrates six major filter types for industrial applications including all types of fluids from water to heavy viscosity oils and lubricants.

MISCELLANEOUS

● UNIFIED AND AMERICAN SCREW THREADS STANDARDS — *Eastern Machine Screw Corp, Truman & Barclay Sts, New Haven 6, Conn.* 11-page booklet contains proposed 1957 revision; presents major, minor, and pitch diameters, giving classes, allowances, and tolerances of all internal and external threads up to and including 2 in. Request direct on company letterhead.

29 SPECIAL TOOLING SERVICES—*National Tool & Die Manufacturers Association, 907 Public Square Bldg, Cleveland 13, Ohio.* 68-page pocket-size directory lists approximately 1000 contract tool and die plants throughout the US and Canada, giving specific products and services offered by each.

Reader Service Department
American Machinist
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AMERICAN MACHINIST, 4-22-57 Not good after June 22, 1957

How Minneapolis-Honeywell holds tapers to a tolerance of ± 2′ ...at a glance

Small tapered needle valves at Honeywell's Brown Instruments Division are tough to gage quickly and accurately. Read how optical gaging makes the job easy.

This tapered needle valve is used to reset a pneumatic process control system. Typical dimensions are 1 19/32″ overall with critical taper section less than ½″ long. The actual taper is 2°14′, plus or minus 2′. Since the valve only moves .030″ in regulating flow, accuracy is critical if the flow rate is to be precisely controlled.

This is the sort of measuring job optical gaging thrives on. At Brown Instruments Division of Minneapolis-Honeywell Regulator Company they use a Kodak Contour Projector to check these pieces at the rate of one every 2½ minutes, picking up not only taper but eight other dimensions and concentricity. With optical gaging they find accuracy is greater, since "feel" is eliminated. Production personnel can *see* any variation from tolerance—there's no disagreement between the manufacturing and inspection. And gage wear has been eliminated as a factor in reducing accuracy.

Got a tough-to-measure part like this? Is gaging taking too long or tieing up too many highly trained men? Is inspection holding up production? Optical gaging on a Kodak Contour Projector may be the answer. To find out more about how it can work for you, send for the booklet "Projection Gaging with Kodak Contour Projectors."

A single Contour Projector checks a wide variety of parts simply by changing charts and fixtures.

EASTMAN KODAK COMPANY, Rochester 4, N. Y.
Apparatus and Optical Division

the KODAK CONTOUR PROJECTOR

Kodak

NEW SHOP EQUIPMENT, MATERIALS, AND PARTS

Baldwin Compacting Press Features Rigid Frame Construction

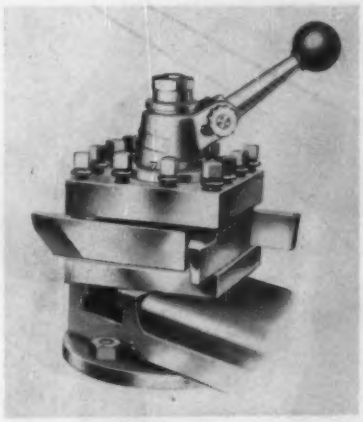
Designed to fit the trend in powdered-metal fabrication toward equipment with multiple motions, Model 30W compacting press has packaged D-frame construction that promotes steadier, more precise operation. Welded-steel frame supports the dieset on all sides, directly applying its own rigidity to the working parts: the upper ram, floating die holder, and ejector mechanism.

Pressure-rated at 30 tons, press can be equipped in the field with such accessories as an independent floating core-rod support for the forming of blind or counter-bored holes, a secondary top punch, a prepressing die control, a dual ejection mechanism, and precision indicators for adjustments.

Drive is variable speed, and range of machine is from 10 to 40 spm. Other specifications: head stroke, 6¾ in.; ejection capacity, 20 tons; ejection stroke adjustable to 4½ in.; die opening, 10 in.; motor drive, 5 hp.

Baldwin-Lima-Hamilton Corp, Box 154, Hamilton Div, Hamilton, Ohio

PORTABLE ARC WELDER Model 2008 has 200-amp output, weighs 80 lb. Unit welds steel 1½ in. thick, cuts steel ¼ in. thick Dimensions are 12 x 13 x 14 in.—*Brennen, Bucci & Weber, 262 Mott St, New York 12, NY*

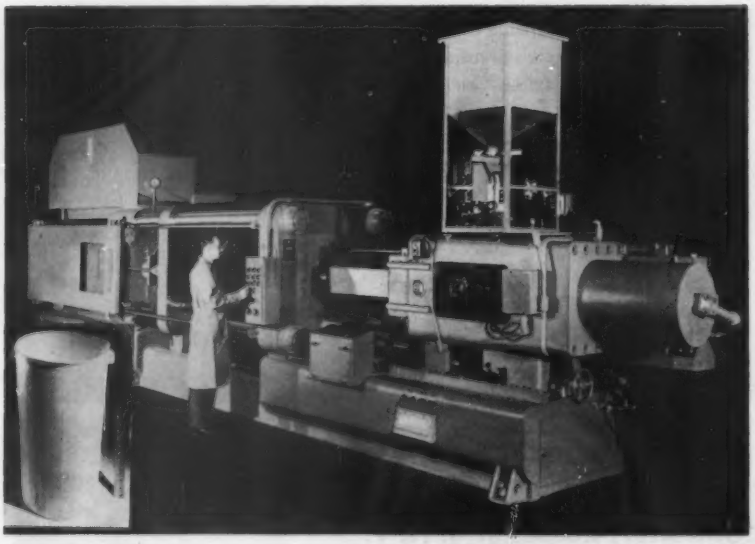


Clamping-Type Handle Locks Turret Tool Post

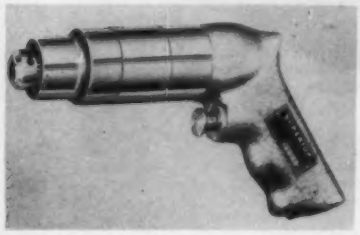
Designed to give a positive locking action to enable turret to withstand vibration even when handling interrupted cuts or at high speeds, clamping handle is outstanding feature of new line of turrets. Raising handle to a 45° angle clamps a locking collar around the center column of the turret with a powerful cam action that locks turret rigidly. Lowering the handle unlocks the unit and permits turret to be rotated freely to any of 12 indexing positions.

Turret, with locking handle, is available in 3 styles and 11 sizes for mounting in T-slot of compound rest or bolt circle of main slide.

McCrosky Tool Corp, Meadville, Penna



DEEP POLYETHYLENE PARTS are molded on this H-P-M 48/64-oz plastics injection molding machine which features 54-in. mold clamp stroke and 84-in. daylight; injection speed of 2410 cu in. of material per min; and mold mounting area of 36 x 54 in. 20¼-in. wastebasket is typical product; but machine will also handle average molding jobs—*Hydraulic Press Mfg Co, Div of Koehring Co, Mt Gilead, Ohio*



Air Drill Has Metering Trigger For Positive RPM Control

Model S-P 1000 industrial air drill has ¼-in. capacity, a safety chuck shield, produces 2500 rpm and has ¼ hp at 90 psi pressure. Patented metering trigger gives positive rpm control from 0 to 2500. Tool weighs 2 lb, has nickel steel gears and preloaded sealed bearings, and is available with pistol grip or straight handle.

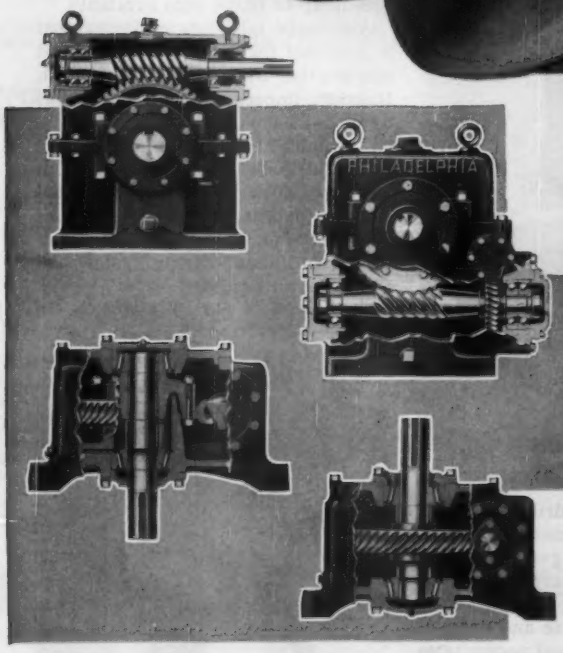
Superior Pneumatic & Mfg, Inc, 4758 Warner Rd, Cleveland 25, Ohio

Here's where Worm Reducer Efficiency Begins

Because the service life and efficient operation of any Worm Gear Reducer depends upon the precise meshing of the worm and gear, we make every possible effort to assure that they are properly centered when the unit is assembled, and that the alignment will be permanent . . . Worms are of finest quality alloy steel with case hardened threads—shaft and threads being smoothly ground and polished after hardening. Worm gears for smaller size units are of solid chill cast nickel-bronze to meet AGMA specifications; while for larger size units the gear is made in two parts—the rim of chill cast nickel-bronze, bolted with fitted bolts and locknuts onto a semi-steel center.

The engineering skill and knowledge put into these features alone are indicative of their entire construction.

Scientific design, unexcelled workmanship, finest materials, rugged construction, noiseless and vibrationless operation, long-life and highest efficiency—are the "end results" that have earned an enviable reputation for Philadelphia Worm Reducers.



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A complete range of unit types and sizes to cover applications from ¼ to 265 H.P. Ratios from 3⅗ to 1, to 6300 to 1. Our latest Catalog, WG-156, gives complete details . . . When requesting Catalog, please use your business letterhead.

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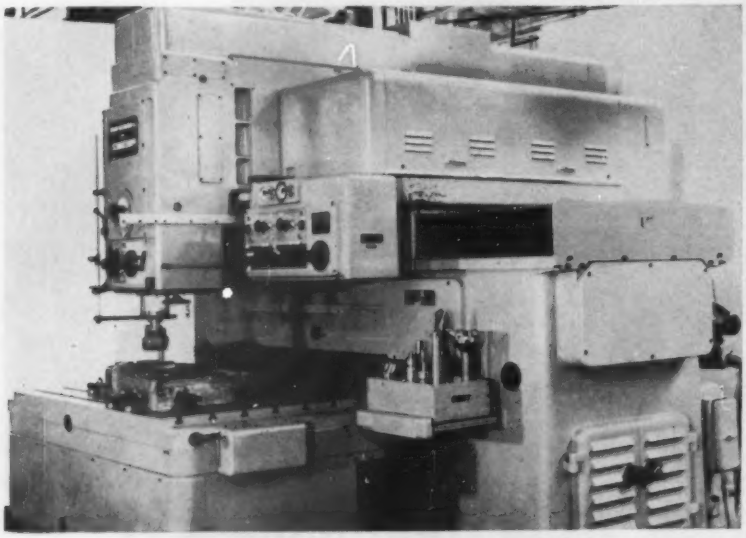
NEW SHOP EQUIPMENT, MATERIALS, AND PARTS



Boring and Milling Machine Features Automatic Spindle Positioning

The Schwartzkopff KBF 2, a product of Germany, allows machining to be carried out without drawings, using only a special process schedule. Coordinate dimensions contained in the schedule are transferred to the machine without calculation. They are preselected at control panel for measuring drums; preselected rods automatically combine to give the desired setting, the minimum increment being 0.0002 in.

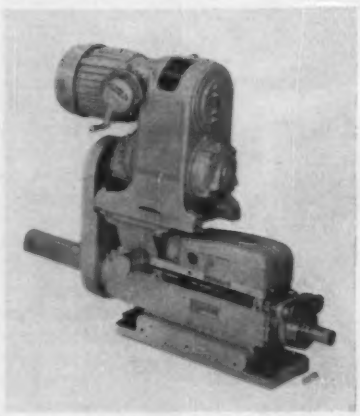
Workpieces up to 1½ tons can be handled on the removable worktable which has a vertical adjustment of 17 in. Very large pieces are mounted directly on baseplate.

Machine is adaptable to punch-card programming in which 28 coordinate settings may be stored and then translated into machine movement in any desired sequence. Other machine features include centrally grouped operating controls; pushbutton tool release; automatic disengagement of machine when preset depth of cut is reached; infinitely adjustable milling feed; 18 spindle speeds from 34 to 1817 rpm; 9 feed rates from 0.0012 to 0.0984 ipm.

Imported by Marac Machinery Corp, 46 S Broadway, Yonkers, NY

Steel locknuts for aircraft incorporate design said to save up to 43% in weight as compared to conventional units. Self-locking fasteners are presently available in 10-32 and ¼-28 sizes.

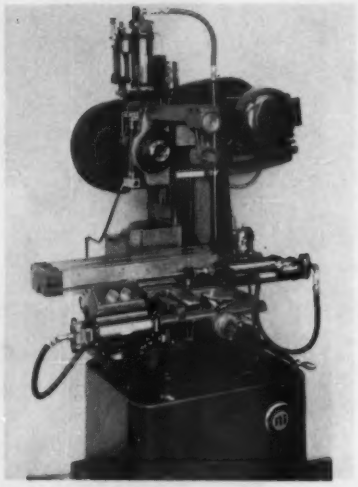
Standard Pressed Steel Co, Jenkintown, Penna



Air-Oil-Matic Drill Units Now Equipped For Gun Drilling

Morris Air-Oil-Matic drill units have been adapted to automatic gun drilling, offering advantages in several drilling operations: deep holes 5/32 in. in dia and up; shallow holes where straightness, size and finish is critical; and where speed necessitates high rate of metal removal, and finish is not critical. High pressure coolant is forced through the drill to contact work at cutting ahead. Spindle speeds up to 8000 rpm can be obtained by adjusting motor handwheel; feeds up to 40 ipm are possible, with infinitely adjustable feed stroke available in 6- or 9-in.-stroke models.

Morris Machine Tool Co, 933-16 Harriet St, Cincinnati 3, Ohio

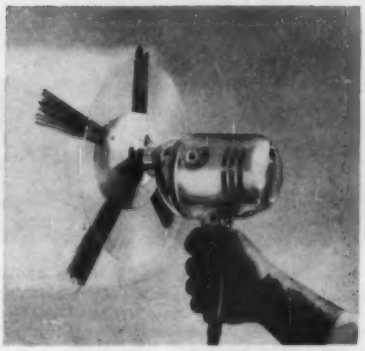


High-Speed Automatic Miller Slices, Dices Germanium Ingots

Machine developed by W H Nichols Co for processing ingots for the transistor manufacturing industry is of the rise and fall spindle type with speeds up to 10,000 rpm available.

Automatic mist lubrication system is provided for spindle bearings and anti-friction overarm arbor support. Diamond-impregnated sawing disks up to 8-in. dia can be accommodated. Automatic transverse feed of 6 in., adjustable in increments from 0.001 to 0.085 in., is synchronized with automatic pneumatic feeds of spindle head and table for high-speed continuous slicing cycles. All feeds are air-actuated.

Distributed by Robert E Morris Co, West Hartford 7, Conn

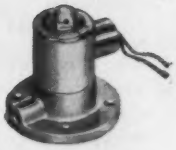


ROTO-SCRAPER removes paint, mill scale, and rust, from metal surfaces prior to finishing. Tool, which can also be used on masonry surfaces, weighs only 2½ lb, and costs $39.50—*Roto-Scraper Co, Dept 70, 2960 W Valley Blvd, Alhambra, Calf*

NEW Ross Starline

air control valve series

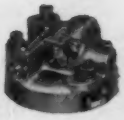
NEW long life



WHITE STAR
SPOOL SOLENOID

GOLD STAR
OIL-IMMERSED SOLENOID

BLUE STAR MV



BLUE STAR TD

BLUE STAR WV

NEW match any head to any valve body!

STRAIGHTWAY NORMALLY OPEN

STRAIGHTWAY NORMALLY CLOSED

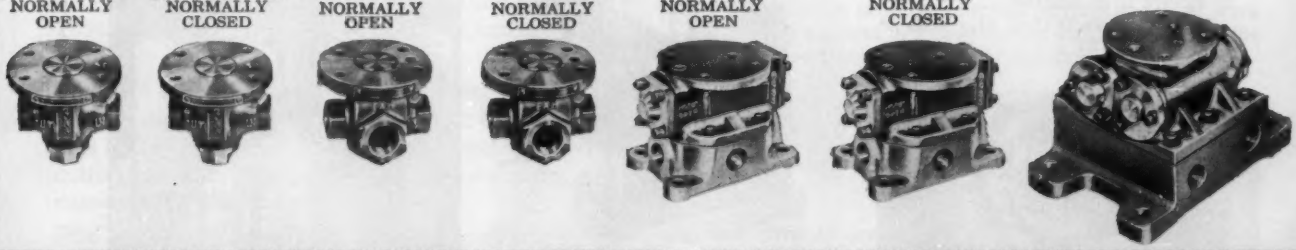
3 WAY NORMALLY OPEN

3 WAY NORMALLY CLOSED

3 WAY NORMALLY OPEN

3 WAY NORMALLY CLOSED

4 WAY



Tests indicate a trouble-free life of over 25 million cycles for valves with the spool solenoid pilot section, and *more than 40 million for all other Starline* valves shown.

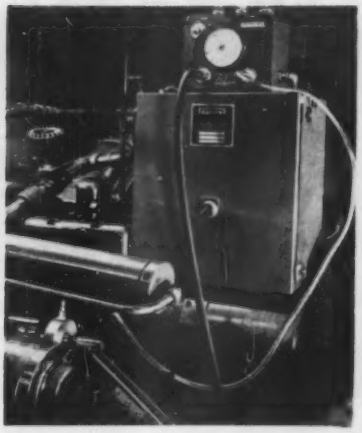
Heads and bodies are completely and instantly interchangeable. Sizes from ¼" to 1¼". Even *more* Starline models coming later. Write for Starline data file.

Ross

A Galaxy of New Air-Control Stars Are Coming Your Way From

OPERATING VALVE COMPANY

122 EAST GOLDEN GATE AVENUE • DETROIT 3, MICHIGAN

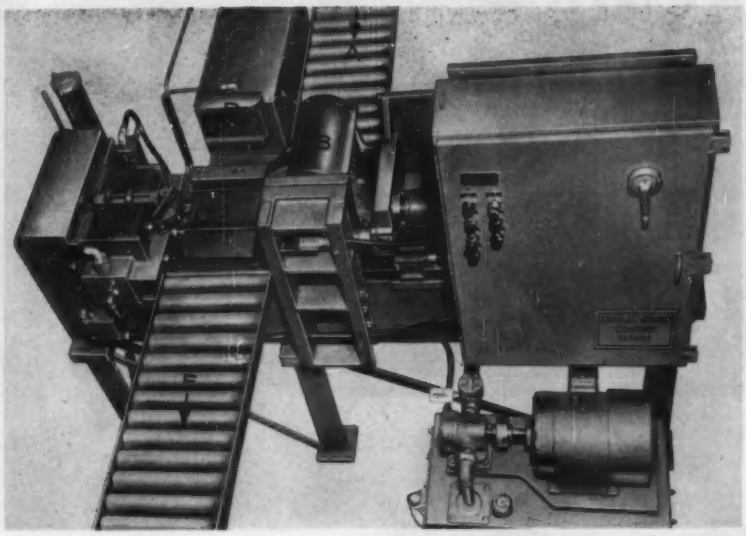


Out-of-Tolerance Trend Spotted by Gage on Centerless Grinder

Continuous measuring gage, series 493-CG, measures output of various types of centerless grinders, and visually indicates any trend toward out-of-tolerance work so that as many as 3 or 4 machines can be tended by a single operator. Built-in time delay response system allows machine to respond to workpiece size only, ignoring such things as spaces between workpieces, oil holes, and annular grooves.

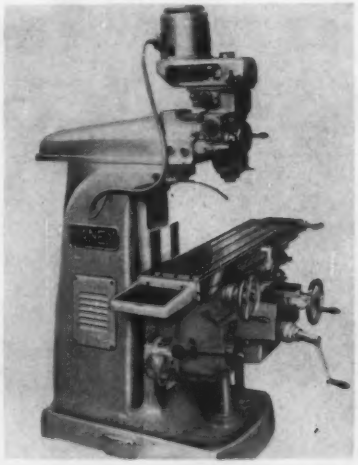
Indicating limits can be set within tolerance spread so that indication is given before limit is reached. Dial is graduated in .000050 in. Gage is normally supplied with air-snap gaging head, but can be supplied with an air-ring gaging head, as shown. Audible signal can be incorporated in device if so desired.

Federal Products Corp, 1144 Eddy St, Providence 1, RI



TRANSMISSIONS are stamped with serial numbers on this completely automated machine. Machine receives transmissions over a roller conveyor (A) which, by gravity, delivers parts to position against spring cushioned stop (B) where, on contact, microswitch starts automatic marking. Cases are moved to marking head (C) after which ejector (D) pushes cases onto conveyor (E). Entire operation takes 6 seconds—*Machine Tool Div, Cadillac Stamp Co, 17315 Ryan Rd, Detroit 12, Mich*

UTILITY TRAY, Model T-10, is designed to hold drills, wrenches and other items that are frequently used with a drill-press. Trays can also hold machined parts during production runs. Available in pairs or in RH or LH single units, trays fit all standard 2, 2¾, and 3½-in. drillpress columns—*Patton Mfg Co, Inc, Small Products Div, 1802 W Pleasant St, Springfield, Ohio*



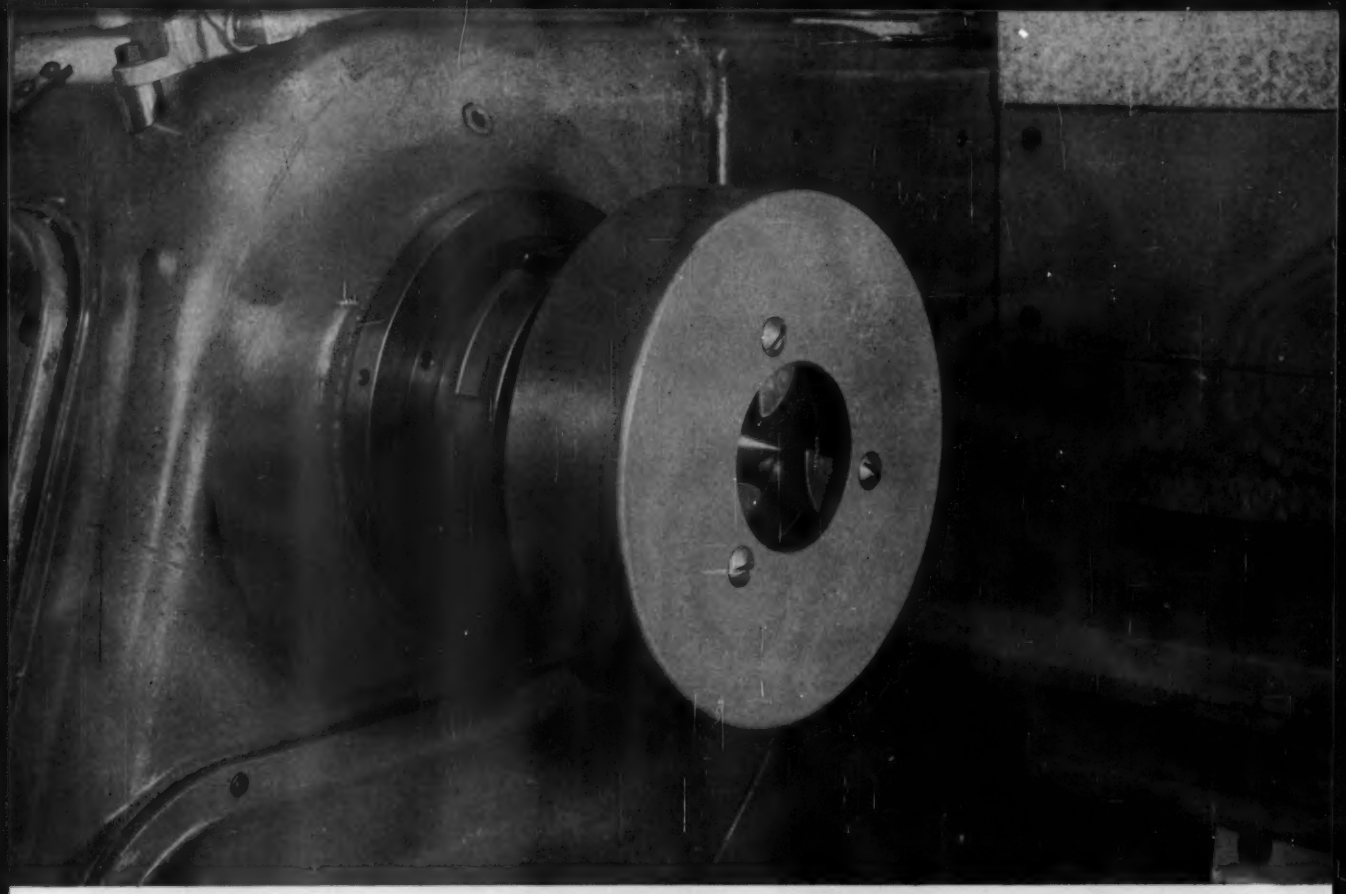
Vertical Milling Machine Has All-Geared Head

Manex VR2 vertical milling machine is made in Italy and has many features, including eight spindle speeds from 75 to 2850 rpm; all-geared vertical head; three automatic feeds, .0015, .003 and .006 in.; backlash compensation on longitudinal and cross feeds; and one-shot lubrication for the table.

Maximum distance from spindle to table is 18 in.; from spindle to column, 25 in. All dials and scales are graduated in .001 of an inch and all electrical controls are on front of machine. Unit weighs approx 2750 lb and has a 40 x 25-in. base.

Imported by Manex Machinery Corp, 204 Central Park S, New York, NY

AUTOMOTIVE PAWLS are machined on this 6-station drilling and broaching machine. Machine loads two parts, drills 4 holes halfway, drills through, chamfers both sides of the holes, reams, broaches four surfaces on both parts in one pass, and unloads. 304 pieces per hr are produced at 80% efficiency—cycle time, including loading, is 18 sec. Index alignment is within .0005 in.—*Colonial Broach & Machine Co, P O Box 37, Harper Station, Detroit 13, Mich*



This time saver will quickly pay for itself in your plant

For turning between centers, give your present lathes the time-saving advantages of the same +GF+ Work Driver used on the world famous George Fischer Lathes.

It clamps and unclamps with a slight turn of the hood. Clamps rough or smooth blanks and out-of-round forgings evenly. Automatically matches clamping force to cutting pressure. No fussing with driving dogs, no time-wasting hand wrenching.

Five models of the +GF+ Work Driver give you diameter capacities of 1/4" to 8-1/16"— each model drives a wide range of diameters. Write for the +GF+ Work Driver Bulletin, which gives full information, specifications, and applications. Write Dept. 104

Best way of all to drive out-of-round forgings and other work pieces. Jaws are held in a floating ring which fits them to the work piece and drives with evenly distributed force.

A half-turn of the hood engages or releases the jaws — no wrench needed. Jaws can easily be set to drive in either direction. Hood is easily removed for changes to jaws accepting different diameters.

Skinner Chuck Company is national distributor for the +GF+ Work Driver. Sales are handled through Industrial Distributors, Machinery Dealers, and Machine Tool Builders.

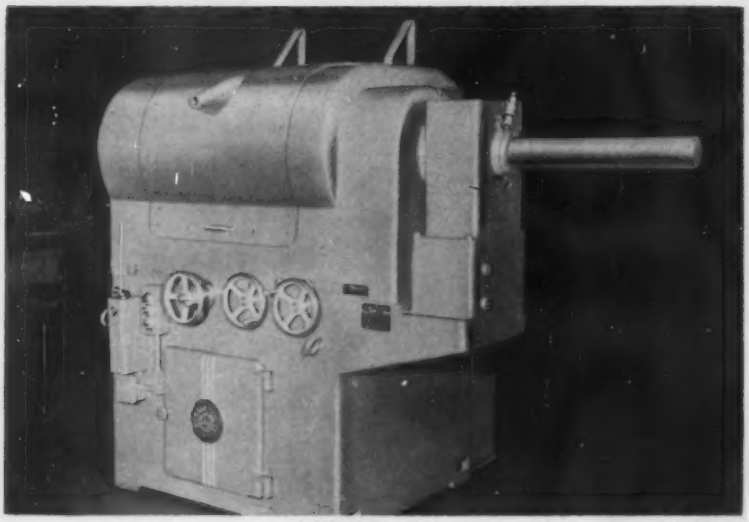
SKINNER CHUCKS

THE SKINNER CHUCK COMPANY

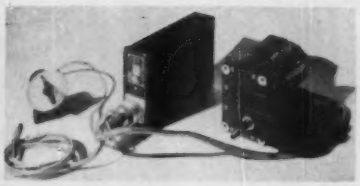
ESTABLISHED 1887

NEW BRITAIN, CONNECTICUT

NEW SHOP EQUIPMENT, MATERIALS, AND PARTS



GEAR SPEEDER, Model 1129-SP, uses enclosed spindles and a built-in listening horn to provide easier and truer noise inspection of gears up to a max dia of 23 in. with a max face width of 10 in. Spindle speeds of 580, 870, 1160 and 1740 rpm are obtained from 4-speed constant-torque ¾-hp motor. Center distance range is 2½ to 12 in.; distance between centers is 25 in.—*Michigan Tool Co, 7171 E McNichols Rd, Detroit 12, Mich*



Remote Positioner Offers Rapid Response and High Accuracy

Remote positioner called Electrolink reaches max speed in 1/50 sec and is said to be accurate within ½ of one degree. Basic components are a data link, which converts manually positioned input into error voltage; an amplifier, which processes signals from the data link and a velocity signal from the servo drive; and the servo drive, which provides power output to the load.

Magnetic-powder clutch isolates the inertia of the servo's rotating parts from the driven load. Torque-to-inertia ratio is consequently high. Unit has been used for remote control of machine tools during machining of radioactive metals. Device operates on standard 60-cycle power.

Lear, Inc, Dept 80, Grand Rapids 2, Mich

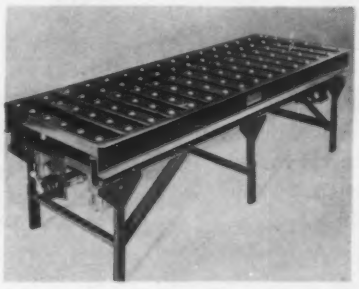
Bandsawing Machine Has Speeds From 45 to 10,000 fpm

Midsaw Tridaulic bandsawing and bandfiling machine, a British product, reportedly is capable of cutting materials ranging from tough armor plate to corrugated paper, and has a speed range of 45 to 10,000 fpm. Speed is infinitely variable and hydraulically controlled.

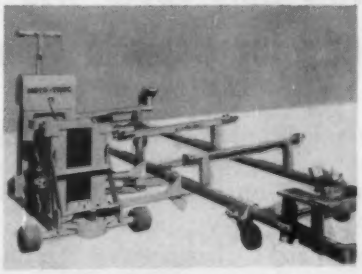
Two main saw wheels are 22 x 1½ in., third is 16 x 1½ in. Table operates on duplex slide, measures 30 in. wide and 60 in. long, is hydraulically controlled and allows for a 30-in. traverse. Table can be tilted 10° in four directions and includes adjustments for setting at compound angles. Four types of saw guides are supplied depending upon size of saw and cutting speed.

Built into the machine are an electric welder, a lever-operated guillotine for cutting off the saws, thickness gage, and a motor-operated grinding wheel. Standard model comes with 36 and 48-in. depth of throat with 20-in. vertical capacity under the saw guides.

Imported by S & S Machinery Co, 140 53rd St, Brooklyn 32, NY



AIR-LIFT TABLE actuated by 4 air cylinders operating on 100 psi is made in 5- and 10-ft lengths and widths to 48 in. Capacity range is from 1000 to 10,000 lb. Illustration shows ball-transfer base; units are also available with roller base—*Sage Equipment Co, Inc, 30 Essex St, Buffalo 13, NY*



Tractor Hauls Trailer By Side Clamp Device

Side-hitch tractor operates from a position alongside the trailer; coupling is made by an electric-hydraulic clamp which engages the underside of trailer frame. Unit is designed to move conveyors loaded with materials which overhang the ends too far to make end coupling possible.

Clamp arm is pivoted so that it can be used on either side, or locked in vertical position for use in conventional manner. Arm can be built to any practical length. Tractor is 33 in. wide, 44 in. long, powered with a 12-v battery. Controls provide two speeds forward and reverse.

Moto-Truc Co, 1959 E 59th St, Cleveland 3, Ohio

TOOL CONTROL SYSTEM

Now, from Seibert, you can obtain tool control boards that are individually designed to suit your production requirements. Panels are subdivided into sections for each type of tool, and divisions are arranged as required with space for two sets of tools for each job. Tool panels and benches are available in 3, 6, 9 or 12-foot lengths. In addition, you can now obtain from Seibert pre-setting gages of all types and also optional equipment such as plastic cyclometer covers with locks, drawers, shelves, etc., to suit your specific needs.

INCREASES PRODUCTION EFFICIENCY

Tool Control Boards are a tested and proven method of increasing the efficiency of production machine tools. They provide a system of scheduling tool changes according to pre-determined efficiency standards. You cut down-time, insure longer tool life, reduce tool breakage, and lower scrap losses.

SUMMARY OF ADVANTAGES

- Reduces down-time, provides an efficient system of programming tool changes.
- Automatically controls machining operations; provides visual record of used life of each tool.
- Assures more efficient use of tools, reduces breakage and scrap losses.
- Provides storage and complete facilities for presetting tools at the machine.

WRITE FOR COMPLETE DATA

Get the complete story on new Seibert Control System. Specify circular B-10, or ask a Seibert Sales Engineer to survey your needs.

SEIBERT

SEIBERT & SONS, Inc. 1009 E. 24th Street • CHENOA, ILLINOIS

QUALITY MULTIPLE DRILL SPINDLE AND PRODUCTION TOOLS

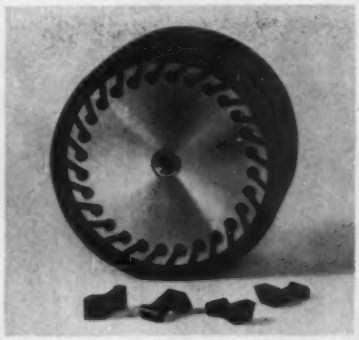
NEW SHOP EQUIPMENT, MATERIALS, AND PARTS

German Hobber Is Adaptable To Automatic Operation

Staehely SH 250 gear hobber is available in two models: normal design with 7 cutter speeds from 74 to 235 rpm, and high-speed design with 14 cutter speeds from 100 to 400 rpm. Hob slide is arranged in horizontal guides and forms a single unit together with the vertical slide. Vertical feed is infinitely adjustable from 0.010 to 0.170 in. per rev of work table, and the horizontal feed from 0.020 to 0.145 in. per rev.

Model illustrated is of special design for hobbing teeth on camshafts with helix angles of approx 50° to 70°. Machine picks up workpiece from storage drum, locates it, chucks and hobs it. Finished piece is automatically returned to storage place. Machine turns out 25 finished shafts per hr. Line of accessories and workholding devices is available.

Imported by Marac Machinery Corp, 45 S Broadway, Yonkers, NY



Expanding-Type Grinding Wheel Has Interchangeable Segments

Series of separate, replaceable rubber segments called flexers grip the coated abrasive belt and form the grinding surface of grinding wheel called Flexcore. Complete peripheral contact is achieved through the centrifugal force of the rotating wheel. Each segment is held in the metal core by a keyed slot and cannot fly off wheel even if belt breaks.

Flexers are available in a variety of hardnesses to produce different cutting actions. Wheels are made to any specified width and come in 3, 4, 5 and 6-in. diameters.

Also available are three additions to the company's line of inflated grinding wheels. Differing in size and operating characteristics, they feature a two-piece construction in which the hollow rubber drum seals itself to the metal core, making a positive, leakproof contact. Model 321, 420 and 536 have diameters of 3, 4 and 5 in., respectively.

Nu-Matic Grinders, Inc, 8224 Carnegie Ave, Cleveland 3, Ohio

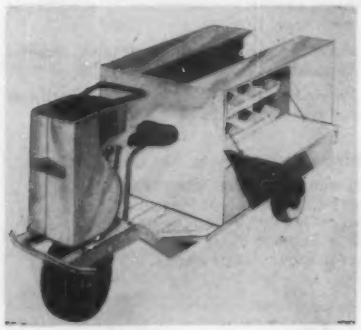
Gries Offers Two Versatile Hardness Testing Machines

Two new instruments have been added to company's line of hardness testers:

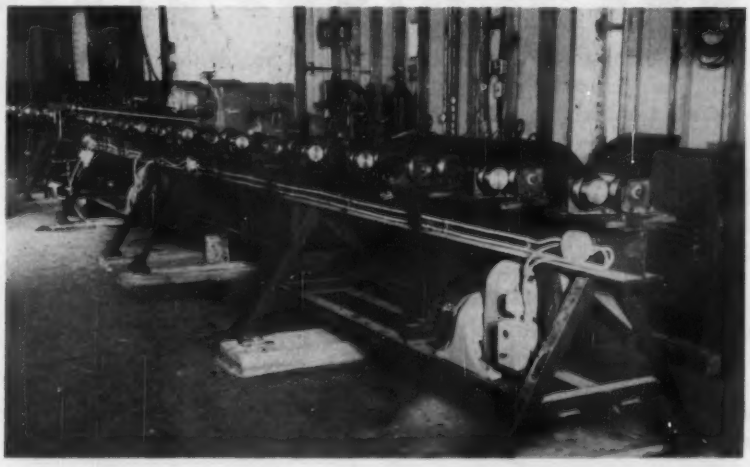
Reflex hardness testing machine, with dead weight loads of 1 kg to 120 kg, has an automatic load selection system, permitting proper load to be imposed at touch of button. It is also possible to switch, in seconds, to the correct magnetically-held indenter for Vickers, Knoop, Grodzinski, or Micro-Brinell, so that different hardness determinations may be rapidly made. Zeiss projection system gives enlarged image (70 to 140X) on projection screen.

Micro-reflex hardness tester is equipped with dead weights ranging from 10 g to 3 kg. Indentations may be magnified up to 500 times through Zeiss optical system. Projected image may be rotated through 90° for ease in measuring indentation. Machine is suited for testing thin specimens.

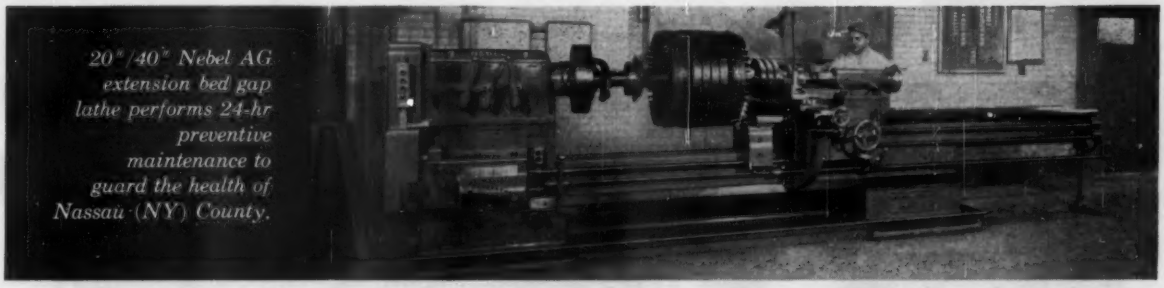
Gries Reproducer Corp, 125 Beechwood Ave, New Rochelle, NY



MAINTENANCE TRUCK features work bench and compartment space for holding tools. Powered by a 2½-hp Briggs & Stratton engine, truck is available in both gasoline and LP-gas models—*Stokvis-Edera & Co, Inc, 18 Secatoag Ave, Port Washington, NY*



MILL LENGTH SHAFTING is hardened to a specific hardness and depth on Thermotool progressive rod hardening mill which can handle carbon steel rods up to 4 in. dia and 30 ft or more in length. Skewed-roll arrangement driven by two 1-hp variable-speed motors permits feed rate and rotation speed of rods to be adjusted independently. For hardening rods to R_c 60+ and a depth of 0.060 to 0.250 in., production speeds are approx: ½-in.-dia rod, 50 ipm; 1¾ in., 10 ipm; 3 in., 4 ipm; 4 in., 3 ipm—*New Rochelle Tool Co, 320 Main St, New Rochelle, NY*



20"/40" Nebel AG extension bed gap lathe performs 24-hr preventive maintenance to guard the health of Nassau (NY) County.

Nebel lathes essential when there's

NO TIME FOR DOWNTIME

"The health of our community depends to a large degree upon the dependability and the great, adjustable capacity of our Nebel extension bed gap lathe," states Mr. Anton E. Sparr, superintendent, Nassau County Sanitation Disposal Plant.

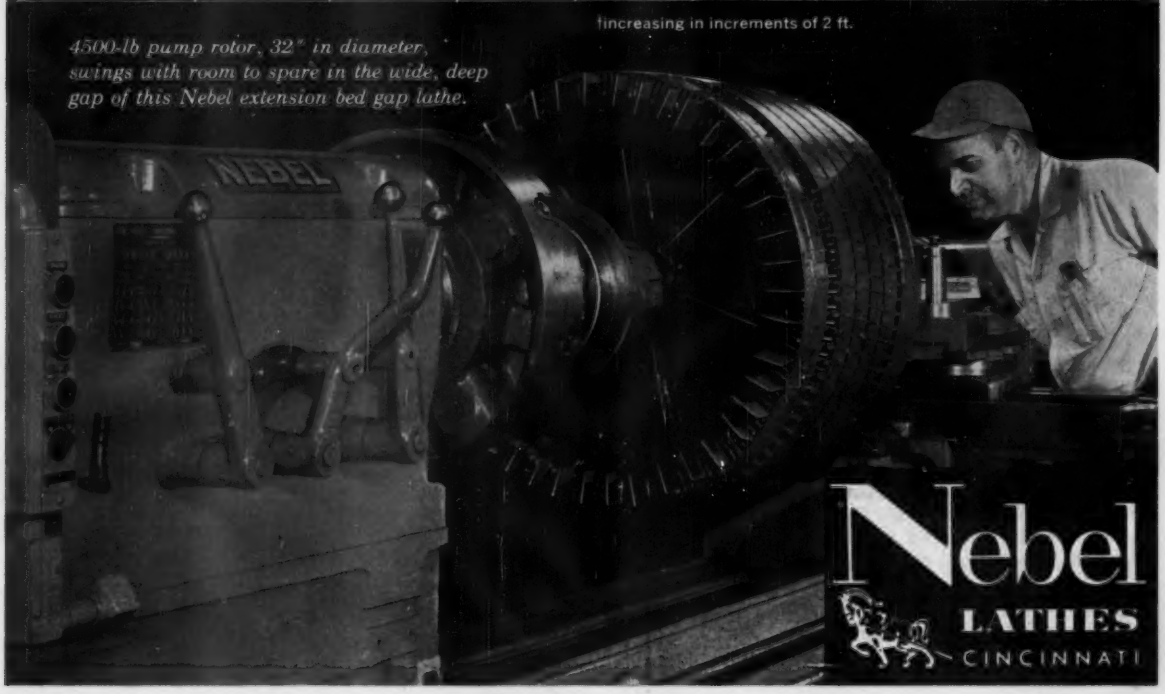
"It has served us without interruption . . . and the almost unlimited swing and center distance capacity has proved so valuable that it has returned a third of the purchase price in less than two years.

"And by doing our own maintenance machining, we eliminate in-transit damage to delicate and valuable parts (pump rotor value: $3,000), have closer control and save valuable time."

This dependable performance and adjustable swing and center distance capacity is available in three different Nebel models . . . see specification chart below. Shouldn't these modern, pay-for-themselves facilities be on the job in your plant? For complete information, write today for descriptive bulletins. Nebel Machine Tool Co., 3407-A Central Parkway, Cincinnati 25, Ohio

	Swing over ways	Swing thru gap	Width of gap	Bed length minimum	Center Distance gap opened	Spindle speeds range, rpm	Motor Recommended
Imperial 20" / 40"	24½"	42"	32"	8 ft.	5' 4"	11-666 or 16-1000	15-20
AG series 20" / 40"	22½"	40"	24"	6 ft.	4' 0"	9-280 or 16-500	7½-10
G series 28" / 50"	29"	52"	41"	10 ft.	7' 5"	5-230 or 10-460	20-25

†increasing in increments of 2 ft.

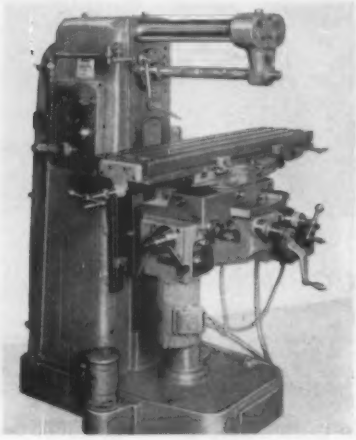


4500-lb pump rotor, 32" in diameter, swings with room to spare in the wide, deep gap of this Nebel extension bed gap lathe.

Secatoag Ave, Port Washington, NY

New Rochelle, NY

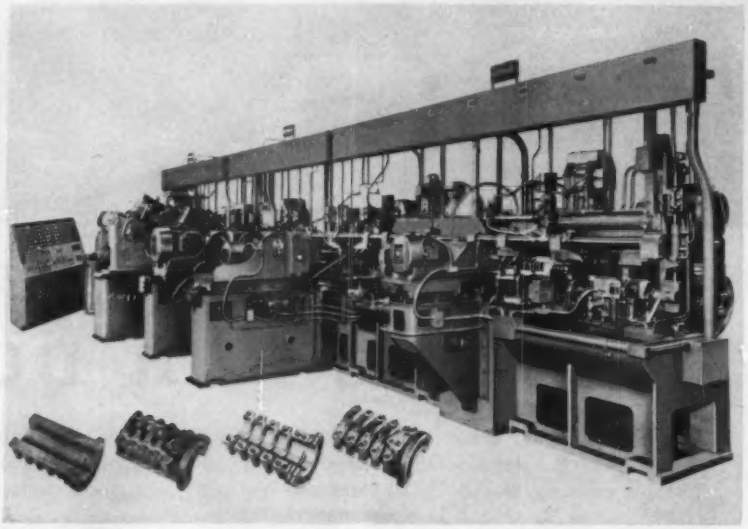
NEW SHOP EQUIPMENT, MATERIALS, AND PARTS



Horizontal Milling Machine Has 12 Spindle Speeds

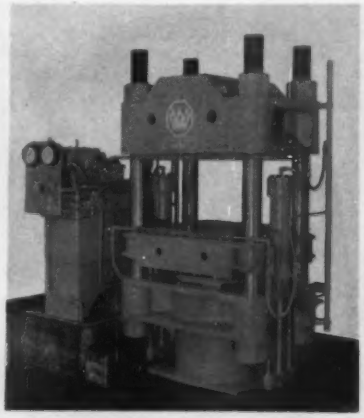
Geared-head horizontal milling machine, Hero Model 1C, made in Denmark, is available in both plain and universal types. The 12 spindle speeds from 35.5 to 1400 rpm are divided into 6 high speeds, which are driven by a chatter-reducing belt, and 6 low speeds, which are gear driven. Other features include hardened alloy-steel gears, hardened and ground spline shafts, inching control, adjustable gibs on slide ways, and a directional lever for starting feed motor. Table of universal model can be swivelled 45°, left or right.

Imported by Morey Machinery Co, 383 Lafayette St, New York 3, NY



BEARING CAPS for V-8 engines are produced from a single casting on this 20-station, fully automated machine. Handling 90 castings per hr, it produces 450 finished caps per hr. Designated Bearing-cap-amatic, unit mills, drills, reams, spotfaces, countersinks, counterbores, and taps before unloading finished bearing caps. Machine features automatic lubrication, built-in coolant system and an automatic chip conveyor—*LaSalle Tool, Inc, 3840 E Outer Drive, Detroit 34, Mich*

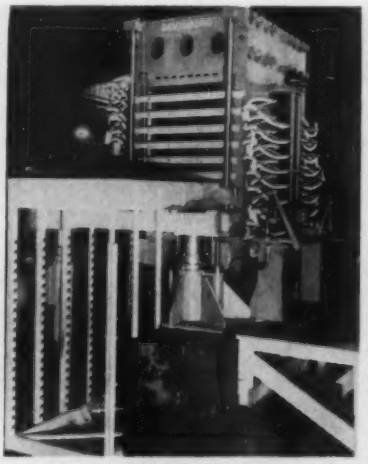
3-D BINOCULAR MAGNIFIER called Magni-Focuser permits accurate reading of micrometers, height gages and other measuring instruments. Pair of matched and balanced prismatic lenses are made from crown optical glass. Available in three models, 1¾ magnification at 14 in., 2¼ at 10 in., and 2¾ at 8 in., glasses are priced at $10.50—*Edroy Products Co, 480 Lexington Ave, New York, NY*



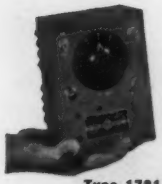
Vertical Press Has Adjustable Speeds, Daylight, and Pressure

500-ton vertical press is a versatile laboratory unit for testing and experimentation purposes. Speed of the moving platen is adjustable from 0 to 170 ipm closing and 0 to 87 ipm opening through a lever-operated pump volume control. Hydraulic pressure is adjustable and is indicated on one of two gages mounted on the control panel. One gage reads to 50 tons, the other to 500 tons. Standard stroke is 24 in., and daylight can be set at 24, 30 or 36 in.

Williams-White & Co, 801 Third Ave, Moline, Ill



HYDRAULIC LAMINATING PRESS, a multiple - opening steam platen press with side-plate construction, is designed for quick loading and unloading. Multiple - opening elevator attached to front of press permits loading every other opening during the pressing cycle. Special rollers within press area are retracted from under the loading plates just prior to closing of press, so that plates cannot be caught and damaged during closing process. Machine is driven by two 34-in. rams at an operating pressure of 2500-psi water—*Birdsboro Steel Foundry & Machine Co, Birdsboro, Penna*



Type 1701-AK for 1/15th hp Shunt-Wound D-C Motors. Type 1701-AU similar, for Series or Universal Motors

Variac®
Motor Speed Controls

Type 1705-B for 1½ hp d-c Motors, Compound with Interpoles

for Perfectly Smooth Operation at Any Speed on Thousands of Applications

Jewelers Lathe

High-Speed Resistance Card Winding

- ★ D-C Motors from A-C Lines
- ★ Full Torque at ANY Speed from full speed to stall
- ★ Smooth Control from zero to full rated with constant torque — no jumpiness — no instability even at the lowest speeds
- ★ Instant Starting — no electron tubes — no warm-up
- ★ Extra-Fast Reverse — dynamic braking on all models larger than 1/15th hp
- ★ High Starting Torque permits quick start under heavy loads
- ★ Ideal for Production where frequent starting and stopping required
- ★ Simple to Install — Reliable — Low Cost — Very Long Life — Little and Simple Maintenance
- ★ Fifteen Models for d-c motors from 1/15th hp to 1½ hp — priced from $85 to $270. Quantity discounts on most units.

Photo Courtesy The Arnold Engineering Company, Marengo, Ill.
Toroidal Tape Core Winding Machine

Photo Courtesy The Gabriel Company, Needham, Mass.
Controlling Rotation of Shipboard Radar Antenna

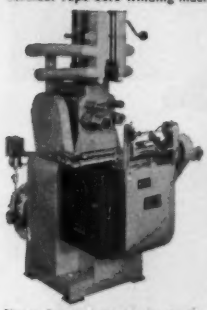


Photo Courtesy W. M. Steele Co., Worcester, Mass.
Hot Stretching Machine for Nylon Thread

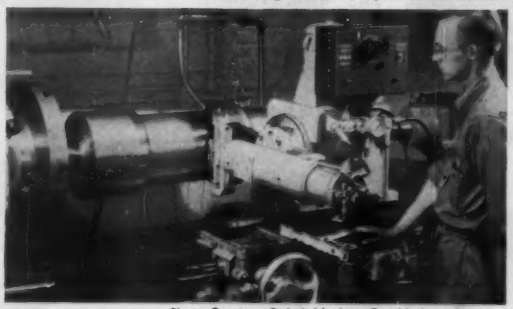


Photo Courtesy Gisholt Machine Co., Madison, Wisc.
Superfinishing and High-Speed Metal Polishing

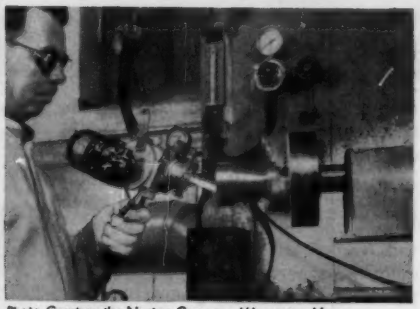


Photo Courtesy the Norton Company, Worcester, Mass.
Ceramic Spray Gun

General Radio Company, 275 Massachusetts Ave., Cambridge 39, Mass.

Please send a copy of the G-R VARIAC Motor Speed Control Bulletin.

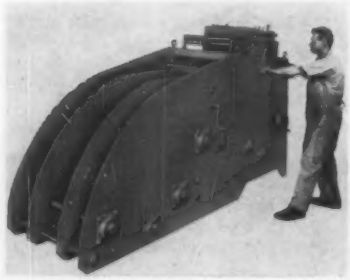
Name.....(615)

Company.....

Street.....City.....State.....

NEW SHOP EQUIPMENT, MATERIALS, AND PARTS

COMPRESSOR PARTS are honed on Microhoning machine built for Tecumseh Products Co. Two piston bores are honed simultaneously on horizontal machines with two opposing spindles (Model 523-2); one crankcase is honed while the other is being loaded. Honing cycle is approx 18 sec, including fixture indexing time. When different piston bore diameter is desired, only tools and gage rings are changed—a 5-min process—*Micromatic Hone Corp, 8100 Schoolcraft Ave, Detroit 38, Mich*



Combination Cradle-Straightener Feeds Flat Stock to Machine

Rated at 4000 lb max capacity, this combined unit called a Koil Kradle accommodates coils up to 60 in. in dia and 18 in. wide. Max stock thickness handled is 0.045 in. Unit automatically supplies a controlled slack loop of straight, flat stock without the use of an intermediate feeding device. Supporting, straightening and punching rolls are power driven. Variable-speed, 2-hp-motor drive feeds stock at controlled rates from 20 to 100 sfpm.

Benchmaster Mfg Co, 1835 W Rosecrans Ave, Gardena, Calif

Redesigned Vacuum Metalizer Provides Shorter Metallizing Cycles

The vacuum pumping system of Model 427 72-in. vacuum-metallizing unit has been redesigned to provide faster evacuation of the chamber, with resulting shorter metallizing cycles and greater productivity. Simplification of the pumping system through the use of fewer but larger-capacity diffusion pumps elimnates certain vacuum valves and connections, reduces piping, and improves over-all production efficiency.

Model has two 16-in. "Ring-Jet" diffusion pumps of greater capacity than the three 14-in. pumps used in former design. The 6-in. booster pump which backs up the diffusion pumps has higher "throughput" than the booster previously used.

F J Stokes Corp, Vacuum Equipment Div, 5500 Tabor Rd, Philadelphia 20, Penna

HAND TRUCKS AND DOCK BOARDS constructed of aluminum are designated Met-L-Ite. Trucks are offered in widths from 24 to 40 in. and lengths from 36 to 72 in., with capacities to 2000 lb—*Voltz Bros, Inc, 2548 Indiana Ave, Chicago 16, Ill.*

Lincoln Adds Two Welders to Line of Idealarc AC-DC Welders

Idealarc welders of 180 and 250-amp capacity are designed for job shops, sheet metal shops, and light production and maintenance welding. Units operate equally well as an ac transformer-type welder or a dc rectifier type, enabling use of all types of manual electrodes, including stainless and alloy rods. Machines operate on single phase, 230-v, ac input power. Continuous current control is provided over entire range of welding heat.

Welders are NEMA rated 180 amp at 25 v, 20% duty cycle, and 250 amp at 30 v, 30% duty cycle. Units are also available as straight ac machines.

Lincoln Electric Co, Cleveland 17, Ohio

WELDER—POWER PLANT UNITS, Models AEA-200 and AEA-200-L, have 12.9-hp engines, produce 225 amp of continuous rated welding current. AEA-200-L can also provide 5 kw of 110/220 ac power for operation of lights or power tools. Both are equipped with Redi-pull starter, are weatherproof, and have shielded mufflers—*Miller Electric Mfg Co, Inc, Appleton, Wis*

BUY Precision THAT FITS...!

for tenths
YOU NEED A
CLEEREMAN JIG BORER

OR

for .001"/foot
YOU NEED A
LAYOUT DRILLING MACHINE

If your work involves gages, jigs, fixtures, or "jigless" production with ultra-fine tolerances, one of the three models of Cleereman Jig Borers is the answer.

But when your work calls for tolerances of .001" per foot, the economy of the Layout Drilling Machine is the "common sense" approach to your problem.

There are installations near you. Your Cleereman distributor can answer your questions and arrange an inspection visit for you.

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... the two-way answer to fastening problems

Here's a combination that slashes production costs and gets rid of fastening problems in a hurry—Milford Rivets made to high-quality standards to assure a better finished product for you . . . Milford automatic rivet-setting machines that can be quickly adapted to your particular fastening needs.

To improve product appearance and strength
. . . to take full advantage of automatic assembly
. . . to cut delivery time and production costs
—get in touch with Milford first!

THE MILFORD RIVET

MILFORD RIVET & MACHINE CO.

MILFORD, CONNECTICUT • HATBORO, PENNSYLVANIA
ELYRIA, OHIO • AURORA, ILLINOIS • NORWALK, CALIF.

Remote Control Positions Valves, Drives, Rheostats

Follow-up type remote control called Dialtrol features a vernier dial which is set to desired position of a valve, variable speed drive control, jack or rheostat. A control motor, with built-in or externally-driven potentiometer, adjusts the valve or drive until proper setting is reached. Jordan Shaftrol, a shaft-mounted control gear motor with built-in potentiometer, is designed specifically for use with the Dialtrol but other gear motors may be used.

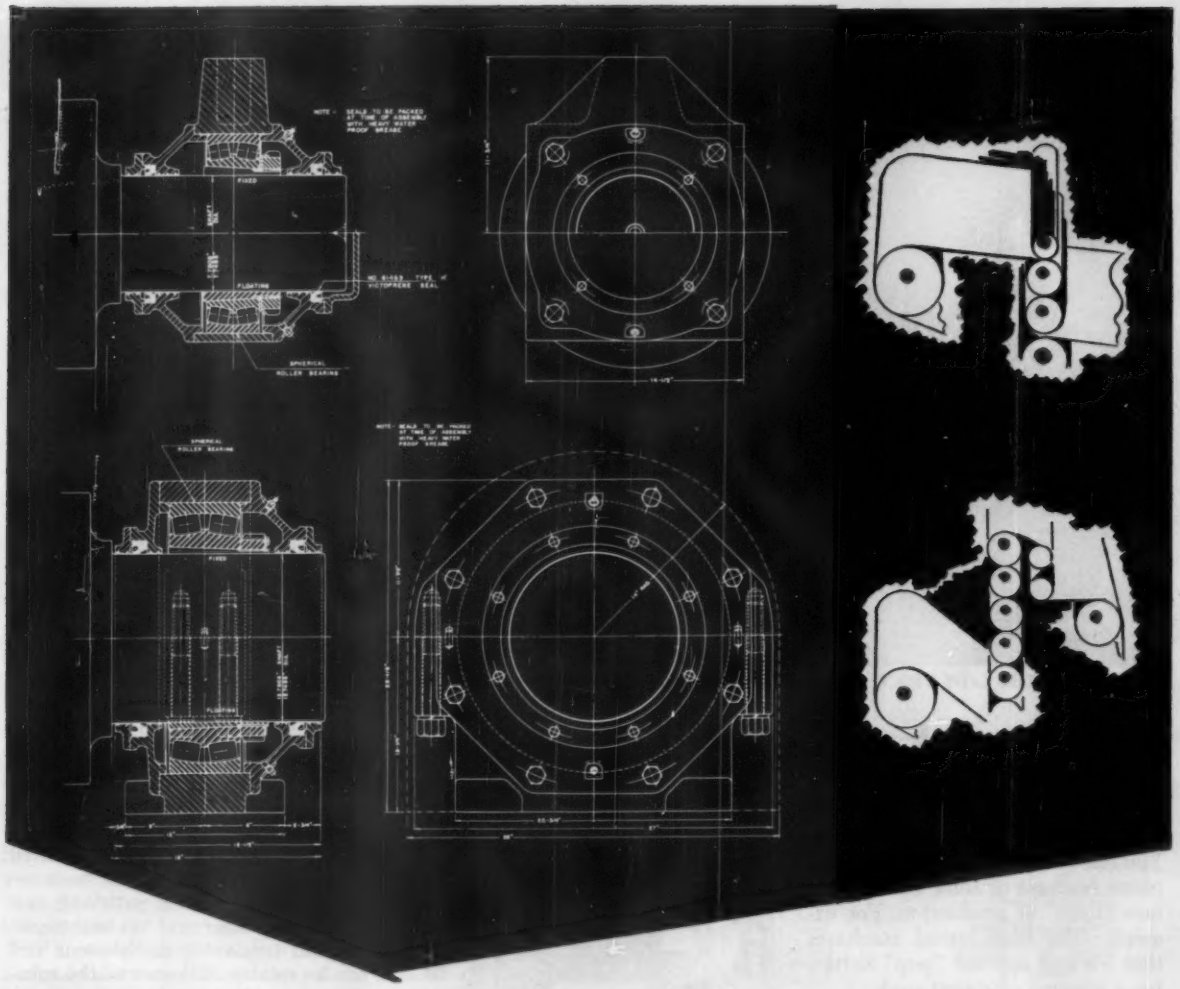
Unit incorporates adjustable anticipation to slow down control motor as desired setting is approached, and can provide direct control for motors up to 1/8 hp and controls motors up to 50 hp through a reversing starter. Standard control operates on single phase, 110v, 60c, and measures 6 x 6 x 6 in.

Jordan Co, Inc, 3235 W Hampton Ave, Milwaukee 9, Wis

Self-Contained Coolant Pump For Small Machine Tools

Bantam coolant pump system uses only one moving assembly; construction makes it particularly suitable for handling highly abrasive liquids.

Flow-control valve gives instant adjustment from 0 to 400 gal per hr and discharge heads to 12 ft. The 5-



a Bearings, Inc. engineered change-over with a built-in plus!

One of our paper mill customers was getting varying caliper readings from center to roll end as the paper came through his calenders. Our investigation showed water-cooled plain bearings were causing a variation in roll diameter from roll end to center.

Our solution was to replace this installation with large bore spherical roller bearings, tapered sleeve mounted with cast housings designed by our Bearing Engineers.

The result? 100% success! No longer are they troubled by roll diameter variations. The PLUS of less maintenance and elimination of frequent bearing replacement . . . the fact that water cooling was no longer necessary, paid for this change-over within a short time!

This is just one of many examples of our *complete* bearing service to *all* industry. Our ability to solve difficult bearing problems is second only to our service in supplying all types and quantities of replacement bearings from the complete list of nationally known bearings we are authorized to distribute!

Rendering bearing service in the territories adjacent to our branches, listed below.

BEARINGS, INC.

OHIO: Akron • Canton • Cincinnati • Cleveland • Columbus • Dayton • Elyria • Hamilton • Lima • Mansfield • Toledo • Youngstown • Zanesville
INDIANA: Ft. Wayne • Indianapolis • Muncie • Terre Haute
PENNSYLVANIA: Erie • Johnstown • Philadelphia • Pittsburgh • York
WEST VIRGINIA: Charleston • Huntington • Wheeling
NEW JERSEY: Camden • **MARYLAND:** Baltimore
DELAWARE: Wilmington •
Subsidiaries: Balanrol Corp. • Buffalo, N.Y.• Kentucky Ball and Roller Bearing Co. • Louisville, Ky.

THE LOW PRICE of a bottle of "pop" starts here . . .

A New Look at "Tools"..

Pausing for a cold, tangy soft drink is an old American custom. You can still enjoy it at pennies-per-pause because of some remarkable new "tools" of production. For example, the high speed machines that fill and cap the "pop" bottles for a fraction of a cent each.

The machinist in the picture above is making parts for one of these machines. He's helping keep costs down, too. He slots the part shown in 90 seconds on a $5,000 DoALL band machine. Slotting formerly took 2¾ minutes on a $12,000 milling machine. Set-up time on the DoALL is less than 5 minutes. Previously it took 20 to 30 minutes.

American industry needs thousands more time-saving tools like the DoALL machine. Then, with fewer people required to produce the necessities of life, more people can produce "non-essentials" that make life pleasanter. Things like soft drinks, motion pictures and baseballs.

The "tools" of production provide the beverage for a "break".

For a lot of people that's a new way to look at tools. But it's a true way.

Manufacturers seeking ways to increase human productivity and cut costs will find much of interest at DoALL . . . bandsawing, grinding, lapping and gaging equipment that is accomplishing things in less time than ever before. Ask for descriptive literature.

Reprints of this series on economics available for your employees.

COLOR, SOUND MOVIE "Production Band Machining" available for group showings. Write on your business or school letterhead for details, or call DoALL locally.

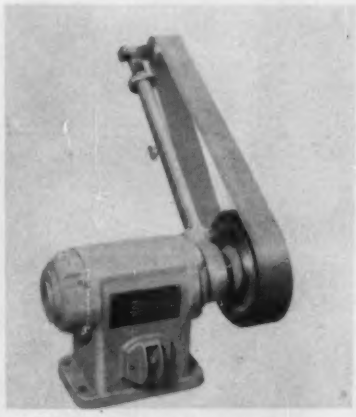
The DoALL Company

Des Plaines, Illinois
38 Local Sales-Service Stores

E-27

gal welded steel tank is equipped with a removable inner basket that separates and retains chips for fast cleanout.

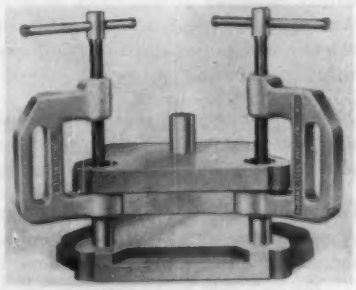
S Gelber & Sons, Inc, 5806 N Lincoln Ave, Chicago 45, Ill



Curtis Adds Bench Grinder to Line of Abrasive Belt Machines

Lightweight Model BBA-O bench grinder has a 6-in.-dia, 2-in.-wide contact wheel driven by a 0.6-hp motor developing a speed of 5100 sfm. Speed provides quick stock removal when grinding, polishing, and deburring. Idler arm has belt-tracking and tensioning mechanisms and can be rotated 360° around the spindle to provide operation in any position. Standard belt is 2 in. wide by 48 in. long. Platen attachment is available for squaring, chamfering, and beveling.

Curtis Machine Div, Carborundum Co, Jamestown, NY



Die Set Pullers Available In Three Sizes

Shur-Pull die set pullers are available in three sizes: No. 1 comes with 1-, 1¼- or 1½-in. pin; No. 2, with 1¾- or 2-in. pin; and No. 3, with

Put HOWELL in Your Product Picture

...and gain the PLUS values in power that count!

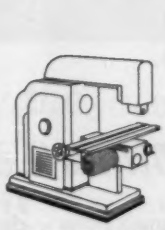
Whatever your requirements for driving metal working machines may be . . . more horsepower in less space, ruggedness for constant start-and-stop operation or the need for streamlining multi-motored, automated equipment . . . you can gain from Howell's 42 years of experience in serving the machine tool industry. Machine designers and plant engineers throughout the industry take advantage of Howell's more than 20,000 motor designs. Here are some of their reasons:

Steel Feet and Frames Won't Crack Under Stress Unlike cast iron, Howell's steel feet won't crack when mounting bolts are tightened excessively. Howell's cold-rolled steel frames can take installation punishment. Cast iron end-plates assure constant shaft and bearing alignment.

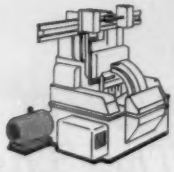
Cool-Running, Long-Lasting Efficiency New stator design with wide slots provides 50% more contact between cooling air and stator laminations. Combined with heat-dissipating copper rotors, this gives you a motor with extra stamina to withstand intermittent overloading or unusually high operating temperatures.

Functional Streamlining Howell motors have no fins, ribs or unnecessary offsets to collect dust deposits. External dirt cannot reduce these motors' cool-running efficiency — their neat appearance is easier to maintain.

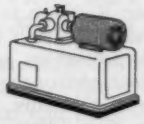
Wide Selection Howell builds virtually all types of industrial AC motors — in sizes up to 300 hp, in all standard enclosures, both rerated and non-rerated; also disc motors and brake motors. For other than standard motor speeds, investigate Howell's complete line of gearmotors — parallel shaft, right angle and the new Line-O Drive series.



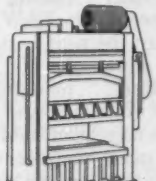
MILLING MACHINES



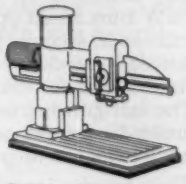
LATHES



HYDRAULIC SYSTEMS



PUNCH PRESSES



RADIAL DRILLS

Among leading machine tool manufacturers who use Howell motors are these:

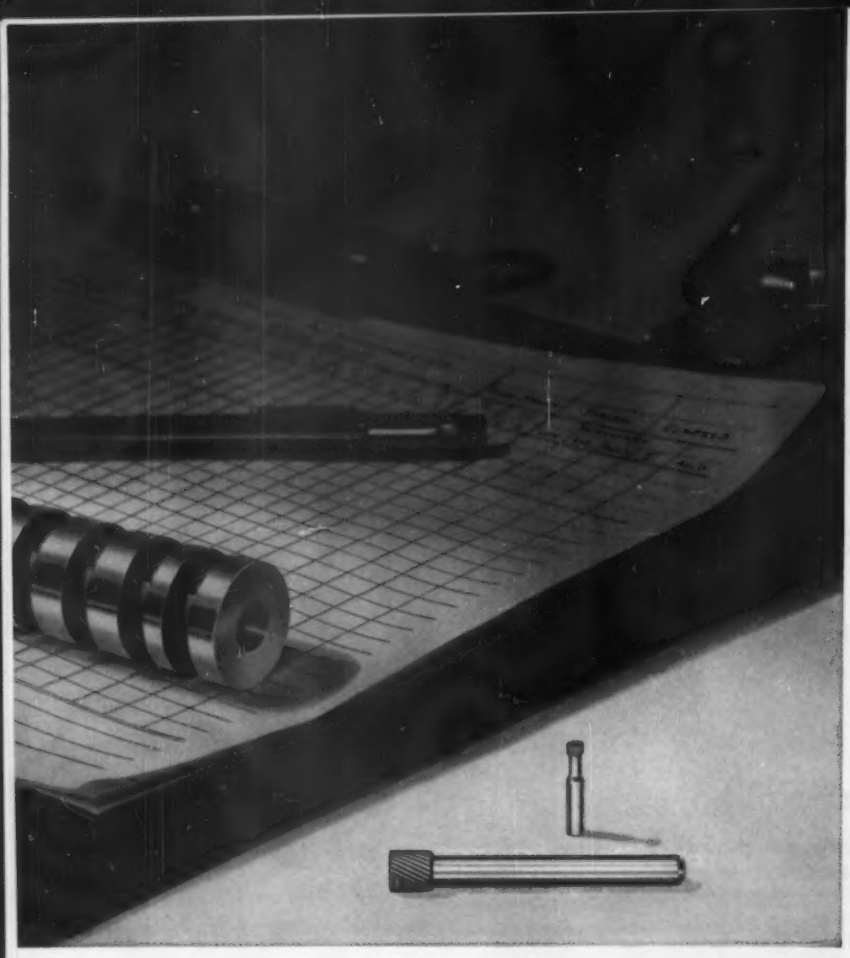
The Cross Co. ● E. W. Bliss Co. ● Warner-Swasey Co. ● Snyder Tool and Engineering Co. ● The Carlton Machine Tool Co. The Cincinnati Milling Machine Co. ● Sundstrand Machine Tool Co. ● Ex-cell-o Corp.

A Howell sales engineer can give you valuable assistance on any motor application. Wire or 'phone collect . . . or drop us a line . . . you'll get prompt action. Howell Electric Motors Co., Howell, Michigan.

HOWELL Red Band MOTORS

HOWELL *motors*

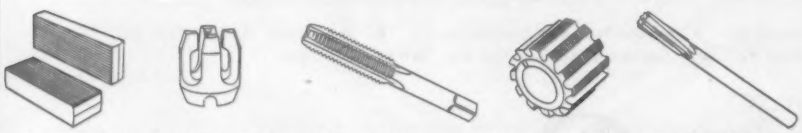
. . . precision built for industry since 1915



Figures Prove
They Last 3 Times Longer!

When it comes to finishing small holes — down to .032" diameter — P&W Kellerflex Carbide Hole Finishing Burs have proved on job after job that they will consistently *outlast and outperform* all other finishing methods and competitive burs. On one recent job, P&W Burs lasted more than 3 times longer than the next best. On another, they delivered up to 5000 pieces per bur. In addition, P&W Burs speed up production . . . machining time is as little as 30 seconds per piece. Accuracy and finish are improved . . . work has consistently been held to .0002" for size, .00005" for roundness, and 4 micro-inches for finish! The fast-growing miniaturization market can mean BIG profits from small parts, and P&W Carbide Burs finishing small holes can help you get your share.

Write now for complete information.
Pratt & Whitney Company, Incorporated
11 Charter Oak Boulevard, West Hartford, Conn.



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PRATT & WHITNEY
FIRST CHOICE FOR ACCURACY
MACHINE TOOLS • GAGES • CUTTING TOOLS

a 2¼-in. pin. Prices are $18, $22, and $30, respectively.

New models are made from a material which reportedly gives five times greater strength, and are guaranteed against breakage.

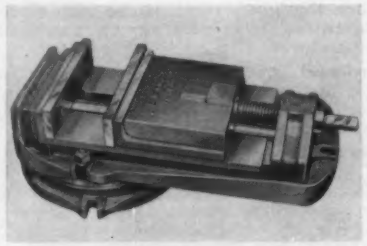
Durant Tool Supply Co, 136 S Water St, Providence, RI

New Bench Press Line Introduced by Bliss

Line includes a 4-ton adjustable bed and horning press, 4 and 7-ton inclinable units, and a 10-ton fixed bed press.

Features are extra-long slide, renewable ball seats and bronze ball cap bushings, cast Meehanite frames, split-bronze bearings, and extra-long, removable V-type gibbing. Units can be equipped with Bliss' rolling key clutch, or an air friction clutch.

E W Bliss Co, Canton, Ohio



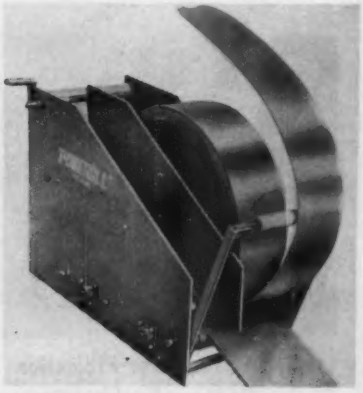
Extra-Strong Swivel-Base Vises For Drillpress, Miller, Shaper

Features of line include new flange construction; all surfaces ground; workholding surfaces always at true angles, or parallel to table; full length bearing on the ground bar and machine ways provided; large Acme steel screw with replaceable bronze nut.

Jaws of the Mogul are ⅝ in. thick,

8⅝ in. wide, 2 3/16 in. deep, open 6 in. Dimensions of the Master are, respectively, ½, 6½, 2, open 4 in. Junior model is ⅜, 4½, 1¾, open 3¼ in.

L-W Chuck Co, 25 S St Clair, Toledo, 4, Ohio

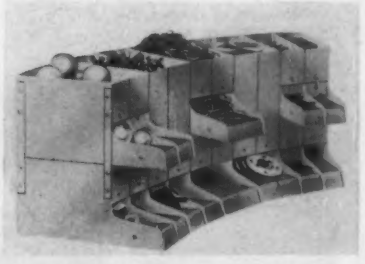


Coil Cradle Can Be Moved From One Press to Another

Poweroll cradle handles stock to 24 in. wide by 48-in. dia, and up to 3000-lb weight. It can be loaded by single operator in one minute; metal coil is simply rolled onto it, without need for crane or hoist.

Unit feeds press automatically. Cradle saves floor space because it abuts the press, needs no space for the slack loop which is stored above it.

Medelton Co, 335 E 142nd St, Bronx 54, NY



Small Parts Bin Is Formed From 12 Basic Components

Speedbin, a do-it-yourself small parts bin is assembled from 12 standard steel components which can be arranged in a limitless number of designs. The bin illustrated has a 19-in. front radius reportedly conforming to natural arm movements. Parts are delivered by gravity flow; rate of

He's doing the job
FASTER and CLEANER

...BECAUSE P&W KELLERFLEX® BURS are MASTER MACHINE GROUND

Precision in every respect, they cut faster and smoother without chatter or bounce and deliver an overall performance efficiency that *no* hand ground bur can possibly match. All P&W Burs of the same size and shape are exact *duplicates* . . . have *identical* cutting characteristics. And you can select the *right* bur for all your jobs from the complete P&W Kellerflex line that includes: high speed steel or solid carbide types, 3 basic cuts, 4 shank sizes, 6 types of master ground fluting and 18 standard shapes (plus hundreds of specials). Available from stock at the P&W Branch Office near you.

Write now for complete information.
Pratt & Whitney Company, Inc.
11 Charter Oak Boulevard, West Hartford, Conn.

. . . MILLING CUTTERS • CUT-OFF BLADES • END MILLS • KELLER CUTTERS • KELLERFLEX BURS . . .

PRATT & WHITNEY
FIRST CHOICE FOR ACCURACY
MACHINE TOOLS • GAGES • CUTTING TOOLS

Why NEW "150" HYDROHONER Is Economical . . . Compact . . . Standardized

Basic Micromatic "150" Machine, suitable for both internal and external Microhoning.

Now, even manufacturers with limited capital can afford Microhoning . . . with all its benefits including efficient stock removal, accurate geometry and controlled surface finish. The new Micromatic "150" Hydrohoner is the answer!

Because it is standardized and produced in quantity, this quality machine is economical. (Special engineering is limited to tooling and fixturing.) The design and quality of the "150" assures performance equal to more expensive honing machines. It has a 12" stroke and Microhones diameters up to 1½" . . . yet requires just 34" x 52" of floor space.

The Micromatic "150" is ideal for the manufacturer with limited capital, short production runs or a need for standby equipment. Immediate delivery from stock on basic machines.

The principles and application of Microhoning are explained in a 30-minute, 16mm, sound movie, "Progress in Precision"... available at your request.

☐ Please send me "Progress in Precision" in time for showing on_____(date).
☐ Please have a Micromatic Field Engineer call.
☐ Please send Microhoning literature and case histories.

NAME_____
TITLE_____
COMPANY_____
STREET_____
CITY_____ ZONE____ STATE_____ E

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN

flow is controlled by adjustable shutter. Each unit can be adjusted in width from 2½ to 15 in. Height is either 4½ or 9 in. Speed nuts requiring only one twist to tighten are used for assembly.

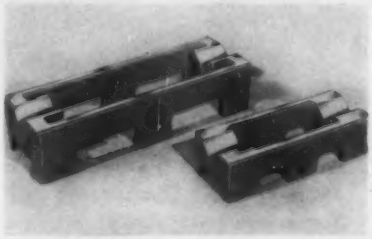
Speed Assembly Co, Box 344, Fords, NJ

Staging Fixtures For Projection Gaging Fit Many Intricate Parts

Compact assortment of hardened and ground precision inserts has been developed to solve the parts locating problem for a wide range of projection gaging applications. Main base casting has appropriate surfaces to accommodate the various locating pieces. Special locking keys permit base to be used as shifting or traveling unit, making it practical to gage parts up to 4 in. long.

V-type inserts handle parts from 1/32 to ½ in. in dia, while shelf-type inserts take flat or odd shaped parts. Standard kit, called Multi-Stage, includes a rotary locating spindle that mounts in the base, and a ground work plate. Bulletin available.

Automation Gages, Inc, Sibley Tower Bldg, 25 North St, Rochester 4, NY

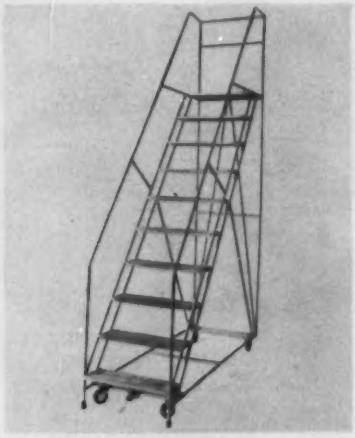


Combination Parallel and V-Block Speeds Drillpress Work

Imp Mules are used to support work on drillpresses, benches, and surface plates, and are useful tools for the diemaker's bench. V's at each end

are in line and can easily be adapted as drill jig for rounds. Two sizes are available: No. 2, 3¼ in. wide, 9 in long, 2¼ in. high, priced at $8.95, and No. 3, 4½ in. wide, 12½ in. long, 3 in. high, priced at $12.60.

Illinois Metal Products, 429 W Superior St, Chicago 10, Ill

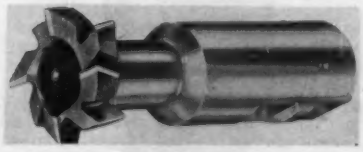


8 to 12-Step Safety Ladder Locks Quickly, Rolls Easily

Line of Safety-Step ladders has locking feature that raises casters and lowers front legs, locking them securely to the floor to prevent tilting, swaying, and slipping. Lock is engaged at front of ladder by foot pressure.

Expanded metal steps of ½-in. 13 gage or ¾-in. 12 gage, and protective railing at sides and top are features.

Tri-Metal Ladder Co, Berwyn, Penna

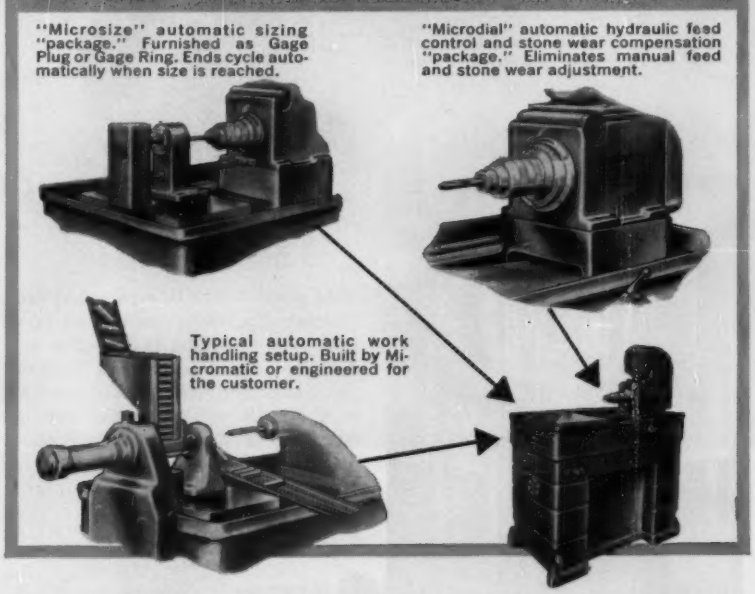


STANDARD T-SLOT CUTTERS made of HSS can be furnished with chip breakers ground on teeth to reduce chip size. Cutters range from ¼ to 1½-in. bolt size. Carbide-tipped units are made to order—*Quality Tool Works, Waukegan, Ill*

Tool and Cutter Grinder Is Offered in German Model

Kuhlmann model FSM/M grinder is built in West Germany and is suitable for sharpening milling cutters,

How NEW "150" HYDROHONER Can Be Automated to Any Degree . . . Easily . . . Economically


"Microsize" automatic sizing "package." Furnished as Gage Plug or Gage Ring. Ends cycle automatically when size is reached.
"Microdial" automatic hydraulic feed control and stone wear compensation "package." Eliminates manual feed and stone wear adjustment.
Typical automatic work handling setup. Built by Micromatic or engineered for the customer.

The basic Model "150" Hydrohoner is a new, standardized and economical Microhoning machine . . . priced for manufacturers with limited capital or relatively short production runs.

The basic machine features automatic stroking and hydraulic initial tool expansion and collapse. Various degrees of automation can be easily added at any time to the basic machine as required by individual manufacturers' needs. Micromatic "package units" which provide specific automation functions are illustrated. Design of this basic horizontal machine and its stationary bridge facilitate addition of these "package units". For complete automation of the "150" Hydrohoner, Micromatic will build automatic work handling devices or assist users in designing their own automation of work handling.

Send coupon for complete information.

Learn how Microhoning will give efficient stock removal, closer tolerances, accurate alignment and functional surfaces.

☐ Please have a Micromatic Field Engineer call.
☐ Please send Micromatic literature and case histories.

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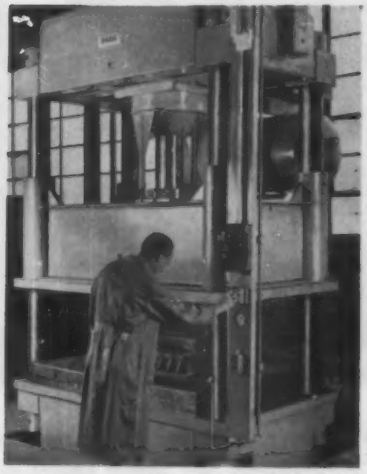
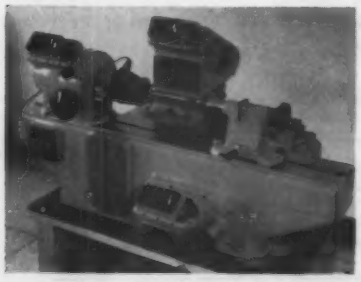
MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

cutter heads, single-point turning tools, thread- and hob-milling cutters, carbide-tipped tools, and end-mills. Special attachments are available for reamer sharpening, radius grinding, and for the sharpening of helix-fluted tools. Machine sells for $1250.

Imported by Eric R Bachmann Co, Inc, 27-11 41st Ave, Long Island City 1, NY



DIE TRYOUT PRESS, Dake 300-ton hydraulic type, tests dies for Cripps Engineering & Tool Co, Chicago, before shipment. Single- and double-acting presses are available in 18 electrically operated models—*Dake Corp, Grand Haven, Mich*



UNIVERSAL OPTICAL MEASURING MACHINE checks the contours of 3-dimensional cams to tolerances as close as 0.00005 in. English-made machine, which records rectangular coordinates and rotary movements simultaneously, is also adaptable for checking gears, threads, length measures, and gap gages—*Imported by J Arthur Deakin & Son, 150-28 Hillside Ave, Jamaica 32, NY*

TUBE AND PIPE NOTCHER called Pedi-Notcher reportedly can double notch both ends of a tube in 15 sec or less, and can handle as many as 7 individual dies at one time. Unit is available in 6 models with capacities ranging from 1- to 4-in.-max OD—*Wallace Supplies Mfg Co, 1306-12 Diversey Pkwy, Chicago 14, Ill*

MULTIPLE-COLUMN AIR GAGES can be supplied with any number of columns for a given application. Stock delivery is available in standard instruments ranging from 2 to 8 columns. Features include self-cleaning pressure system, interchangeable components, 2-step amplification conversion, and zero-centered scale—*Dearborn Gage Co, Air Gage Div, Dearborn, Mich*

Air-Cooled Compressors In Medium-Capacity Range

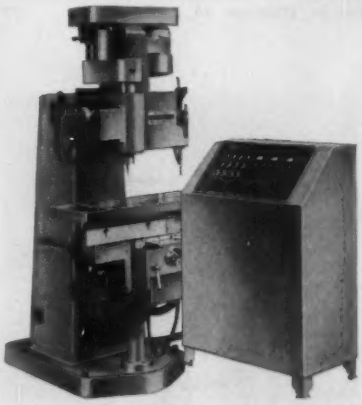
New units include a 45-hp CT-4 model developing 175 cfm, and the 75-hp CT-6 delivering 340 cfm. Both are two-stage, single-acting compressors which develop their rated capacities at only 970 rpm.

Additional features are low floor

(Continued on page 212)

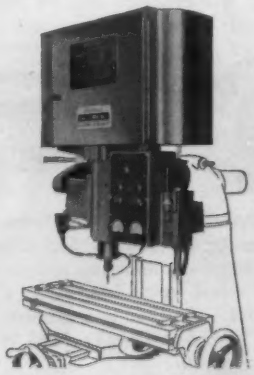
(Advertisement)

REPRODUCE WITHOUT TOUCHING THE MODEL — WITH PRATT & WHITNEY VELVETRACE EQUIPMENT

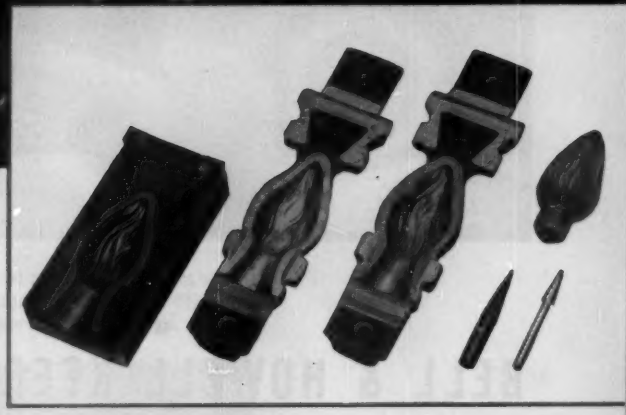


VELVETRACE® MILLING MACHINE . . .
Ultimate in accuracy for 3-dimensional tracer-controlled reproduction. Spindle speeds from 310 to 10,800 rpm. Work size capacity 9" x 12".

THE VELVETRACE DUPLEX ROTARY FIXTURE . . .
is easily mounted on the table of the Velvetrace Milling Machine. Offers faster setup and machining, and more desirable feed patterns, for milling a variety of linear or circular work.



VELVETRACE MILLING ATTACHMENT . . .
a complete, easily attached unit that brings the outstanding advantages of Velvetrace 3-dimensional tracer control to most conventional milling machines.

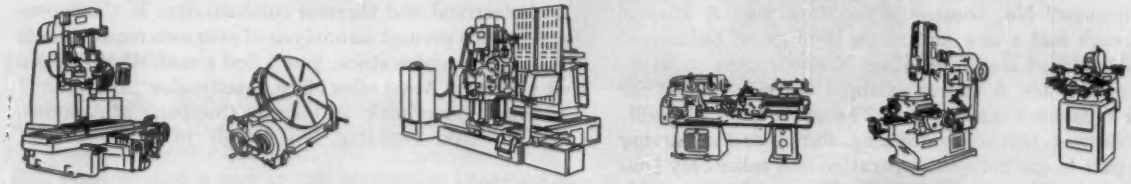


Putting PRECISION REPRODUCTION *in a New Light*

BECAUSE THE PRATT & WHITNEY "VELVETRACE"® MACHINE DUPLICATES THE FINEST DETAIL WITHOUT TOUCHING THE MODEL . . .

These flame-shaped light bulb molds, produced for Corning Glass Works, were machined with such fine detail on the Velvetrace that no hand finishing was required.
Ideal for your die, mold, prototype and other work, the Velvetrace employs a unique *non-contacting* tracer control that follows any 3-dimensional model without touching it . . . cannot damage your model, however soft or fragile, even when using the smallest diameter tracer points. Fully automatic operation with variable speed control to compensate for changes in contour, and a wide range of spindle speeds from 310 to 10,800 rpm insures you fast, economical production.

Write for complete information.
Pratt & Whitney Company, Incorporated,
11 Charter Oak Boulevard, West Hartford. Conn.



JIG BORERS . . . ROTARY TABLES . . . KELLER MACHINES . . . LATHES . . . VERTICAL SHAPERS . . . CUTTER AND RADIUS GRINDERS

PRATT & WHITNEY

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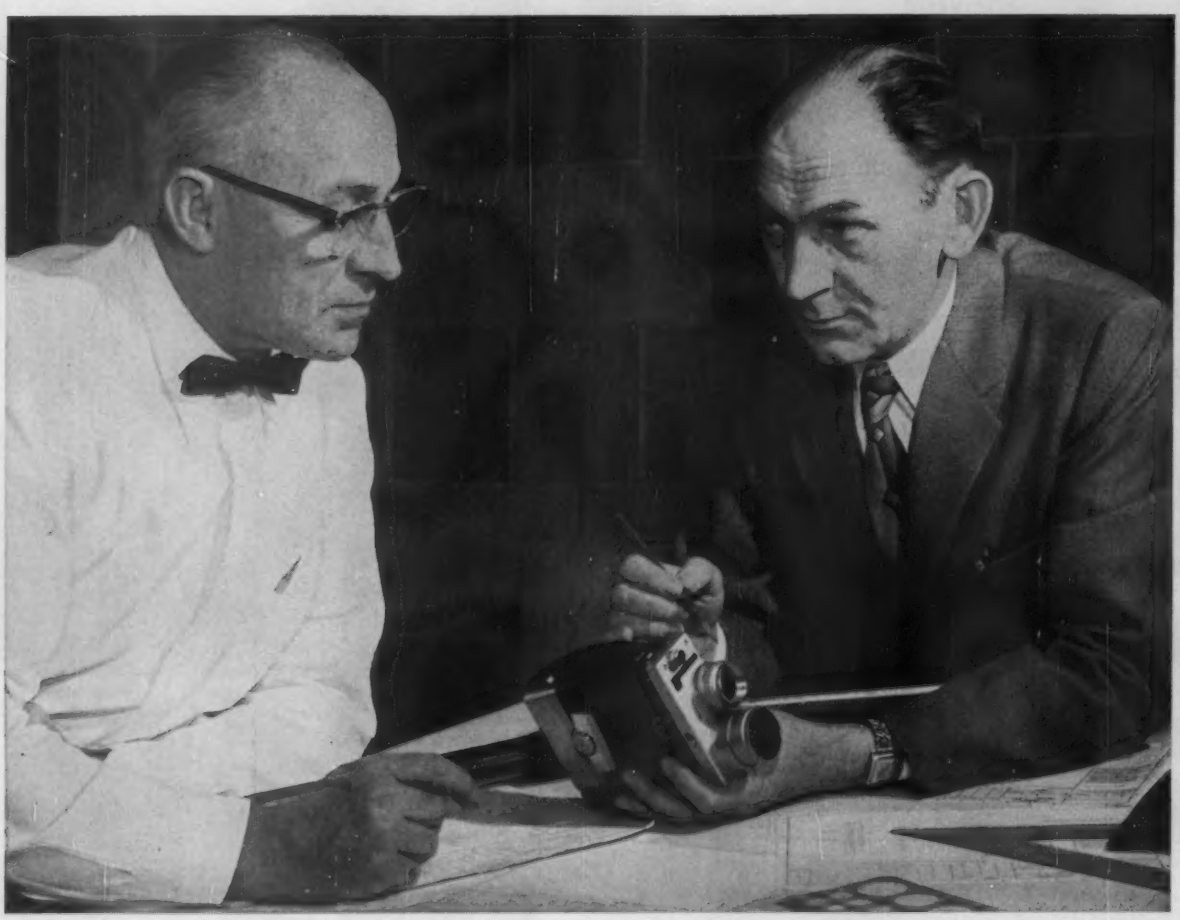
MACHINE TOOLS • GAGES • CUTTING TOOLS



Essential teamwork between design and production departments calls Oscar Riese, left, Superintendent of Metal Parts Manufacturing, into conference with Chief Engineer Paul Richartz, right.

BELL & HOWELL KEEPS COSTS IN SHARP FOCUS AND USES ALCOA SCREW MACHINE STOCK

Competition is toughest at the top. Nobody knows that better than Bell & Howell, world's largest manufacturer of motion picture equipment. On one hand, there's insistence on precision and fine appearance; on the other, emphasis on cost reduction through faster production.

Dilemma? No, because every time Bell & Howell engineers find a new and faster production technique, Alcoa® Aluminum Screw Machine Stock lives up to its end of the job. A classic example is the lens nose for their Wilshire 8 mm camera. The cycle time for drilling, turning, threading, forming, fluting and engraving this part in one complete operation now takes only 1/50 of the period required originally. Even so, surface finish is held to 32 rms, with other tolerances as tight as .001".

Bell & Howell took a long, hard look at every brass part during the shortages in 1951. They weighed aluminum's advantages—corrosion resistance, excellent machinability, light weight, ready availability and the low cost that comes with three times as many parts per pound. As a result, they're designing first for aluminum and using a whopping 300,000 pounds of Alcoa Screw Machine Stock annually.

To the values that prompted Bell & Howell's decision, add electrical and thermal conductivity. If these considerations prompt an analysis of your own requirements in screw machine stock, you'll find a man who can help at your local Alcoa sales office, listed under "Aluminum" in your phone book. Aluminum Company of America, 868-D Alcoa Building, Pittsburgh 19, Pennsylvania.

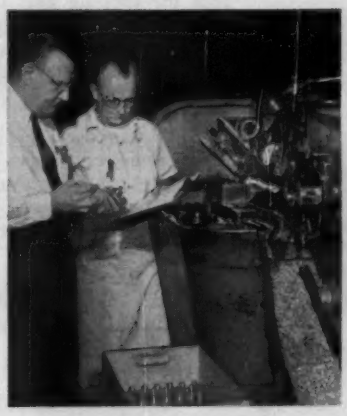
Lens mounts, control knobs, sprockets, film guide rollers and lens caps are among the typical parts machined by Bell & Howell from Alcoa Aluminum Screw Machine Stock.

Purchasing session brings together Chief Metallurgist Arthur Bartmann, left, and Ernest Van Cleave, right, screw machine stock buyer.

IN PURCHASING

"We started with Alcoa and we've always bought from Alcoa. The fact we've never had a reject on their screw machine stock shows that our confidence is well placed. Technical counsel is another advantage. Alcoa helped us assess the relative values of corrosion resistance and machinability to select the alloy best suited to our needs. In the area of deliveries, we've had wonderful cooperation through coordination of shipments with our production schedules. Finally, since heavy stock removal is characteristic of our operations, resale of scrap is an important factor in material cost."

Checking the part (a telephoto lens mount) against the print are John Weber, left, general foreman, and George Sevick, right, operator.



IN ENGINEERING

"Ours is a quality product, depending on a high caliber of precision and appearance for popular appeal. We value aluminum because it lets us design with assurance that the metal will measure up to our requirements and impose no problems in production. We have found that aluminum gives us the high finish and the perfect match from part to part that good appearance demands. We like the versatility that affords us a choice between plating and anodizing. Light weight, achieved with aluminum, is a significant sales point."

IN PRODUCTION

"Concentricity, depth of flutes, diameter of the bore on this lens mount are typical examples of the close tolerances demanded; .001" is common. Yet, when we find a way to cut production time on a part from more than four minutes down to 49 seconds, aluminum keeps pace with machining speeds. It doesn't punish the tools, so there's less down time for tool changes. And when we're handling 2" bar stock, its light weight is mighty welcome."

THE ALCOA HOUR
TELEVISION'S FINEST LIVE DRAMA
ALTERNATE SUNDAY EVENINGS

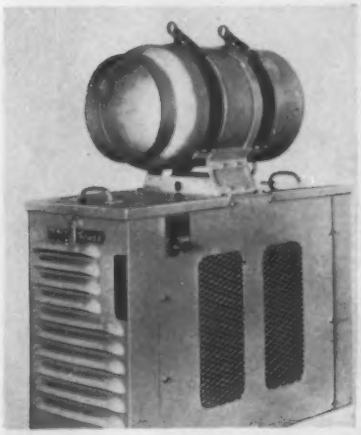
Your Guide to the Best in Aluminum Value

ALCOA ALUMINUM
SCREW MACHINE STOCK
ALUMINUM COMPANY OF AMERICA

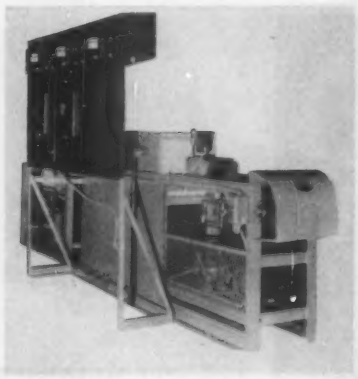
NEW SHOP EQUIPMENT

space requirement, comparative light weight, annular valves to combine max air passage necessary to high performance, double-row, spherical roller bearings in crankshaft journals.

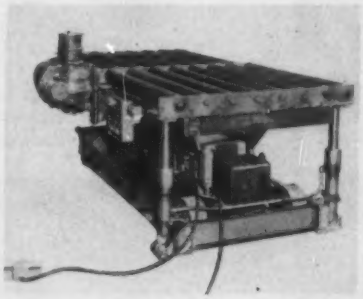
Compressor Div, Atlas Copco Pacific Inc, 930 Brittan Ave, San Carlos, Calif



LPG-ELECTRIC POWER UNIT, Model W12, designed to fit electric-powered hand trucks, features instantly-available, continuous-duty electric power plus economy of LP-gas operation. Unit accommodates interchangeable 20-lb fuel cylinder—*Ready-Power Co, 3826 Grand River Ave, Detroit 8, Mich*



ELECTRIC FURNACE known as the BTU Transheat furnace is designed for alloying, brazing, and soldering of transistors and other semi-conductor products. Custom-designed unit features special muffle design for controlled temperature profile, variable-speed drive, stainless-steel belt, and multiple temperature-control zones.—*BTU Engineering Co, 440 Somerville Ave, Somerville 43, Mass*



LIFT PLATFORM for handling heavy dies uses an electric winch mounted on a roller platform which, in turn, is raised and lowered hydraulically for positioning at the press. Built for a lifting capacity of 20,000 lb, unit has 2 sets of conveyor rollers, 48 in. wide by 96 in. long. Lowered height is 26 in., raised height is 42 in. Elevating motor and pump are controlled through 2-way foot pedal—*West Bend Equipment Corp, 350 Water St, West Bend, Wis*

Safety solvent, Antiox-Type-R, in addition to degreasing, deposits a protective coating to inhibit corrosion and rust. Coating is colorless, dry, non-tacky, transparent, non-toxic, according to manufacturer.

Penetone Co, Box 6AM-3, Tenafly, NJ

Tap, designated Strate-Face, has a specially designed flute and core which make it particularly adaptable for tapping cast iron. Unit is available in standard ground thread sizes from No. 6 through ¾ in.

Besly-Welles Corp, South Beloit, Ill

Aerosol degreaser spray, designated Zipp, removes grease, oil, carbon, gums, and other such materials from all types of machinery. Spray parts to be cleaned and within a minute they can be wiped or rinsed clean. Spray is non-corrosive, non-flammable, and does not contain carbon tetrachloride. Available in 16-oz cans.

Stewart-Hall Chemical Corp, PO Box 66Z, Mt Vernon, NY

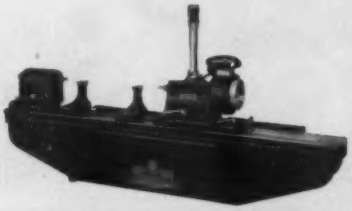
Anti-Friction Compound Increases Tool Life

All-purpose Lubikold, mixed with cutting oils or emulsions reportedly adds 30 to 50% to life of tools or dies, permits faster, deeper cutting without excessive heat.

In tube threading, product is said

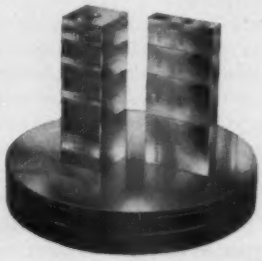
(Advertisement)

Basic Equipment for Higher Precision



P & W STANDARD MEASURING MACHINE

. . . is used throughout industry to measure gages, tools and finished products for diameter, length, roundness, straightness, parallelism and taper direct to .00001" with controlled measuring pressure.



P & W PRECISION GAGE BLOCKS . . . are the basic standards of precision in thousands of plants. Guaranteed for size, parallelism and flatness within a few millionths of an inch. HOKE Blocks (square type) and USA Blocks (rectangular type) are available in steel or solid carbide.

P & W ELECTROLIMIT MILLIONTH COMPARATOR

. . . was developed by Pratt & Whitney for checking Precision Gage Blocks to a millionth of an inch. An essential item of basic measuring equipment for every plant that must establish and maintain truly high master standards of accuracy.

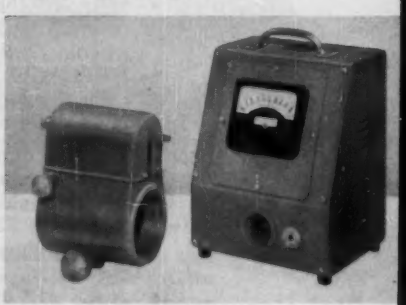
More Effective QUALITY CONTROL *for* HIGH PRECISION PRODUCTION

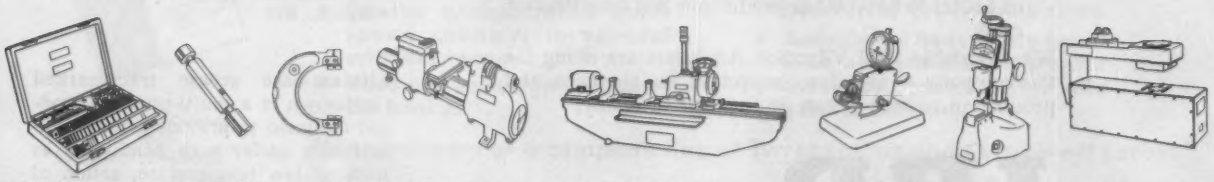
. . . BECAUSE THE *NEW* P & W *ELECTROLIMIT* SUPERMICROMETER IS *EASIER* TO READ *MORE ACCURATELY!*

Equipped with an Electrolimit Tailstock and a high magnification instrument cabinet, the operator can see *at a glance* exactly how much a part is over or under the required dimension. When used as a comparator, deviations are read directly to .00002" on the meter, which has a full scale of .001". The Supermicrometer is now an even more effective means of eliminating errors and reducing scrap losses from high-precision work. Particularly useful for process and final inspection, the Electrolimit "Supermike" is also ideal for use at the machine on lapping, fine grinding and other precision work.

CONVERT YOUR OWN SUPERMICROMETER . . . to an Electrolimit type with packaged unit shown here. Conversion is simply a matter of replacing the old tailstock with the new Electrolimit type.

Write now for complete information about the new P & W Electrolimit Supermicrometer or the Electrolimit Conversion Package. Pratt & Whitney Company, Incorporated, 11 Charter Oak Boulevard, West Hartford, Conn.





GAGE BLOCKS . . . CONVENTIONAL GAGES . . . SUPERMICROMETERS . . . STANDARD MEASURING MACHINES . . . COMPARATORS . AUTOMATION AND CONTINUOUS GAGES

PRATT & WHITNEY

FIRST CHOICE FOR ACCURACY

MACHINE TOOLS • GAGES • CUTTING TOOLS

"MACHINERY ANALYZER saves us $1000 per hour..."

"We've had total savings of more than $100,000 since we purchased the analyzer three years ago. The analyzer has been shipped over 100,000 miles by air, rail, and car to our eight plants without need for repairs or replacements" — reports a leading chemical processor.

The Machinery Analyzer — actually a portable IRD Vibration Analyzer — is used for . . .

- TROUBLE-SHOOTING — to pinpoint faulty components exciting vibration *without costly dismantling.*
- MEASURING DISPLACEMENT — to accurately determine the condition of machinery *without costly dismantling.*
- IN-PLACE BALANCING — to dynamically balance at operating speed the accessible rotating components *without costly dismantling.*

Here are several examples cited by company officials:

- Detecting a broken gear in an important gear reducer saved a major loss of production.
- Savings of $2000 in balancing a ringer assembly because dismantling and loss of production were eliminated.
- A 450 HP motor was balanced, in place, at savings of $8000 to $10,000 in production and maintenance costs.

What portable IRD Vibration Analyzers are doing for this company — to reduce inspection, maintenance, and production costs — it can do for your company.

IRD

For further information — or an actual demonstration on your own machinery by an IRD field engineer — write today to International Research and Development Corporation 797-AM Thomas Lane, Columbus 16, Ohio.

NEW SHOP EQUIPMENT

to make chasers last 50% longer, make die heads open more freely, help to produce a sharper, smoother thread. White powder compound will not gum, harden, cake, or break down under heat.

Lubikold Co, 516 Bergen St, Brooklyn 17, NY

Soldering flux called Wetoil is a stable non-acid flux for soldering copper, brass, steel, and terneplate, which reduces the surface tension of the metal to be soldered thereby increasing the flux activity. Alkaline buffers increase stability of flux but reduce flux's own residual attack to marked degree. It penetrates oil and grease, withstands a wide temperature range without oxidizing. Price: $2.75 per gal.

Farrelloy Co, 1217 N 26th St, Philadelphia 21, Penna

Cast aluminum handwheels of solid disc type have been added to company's line of handwheels. New models, 4 and 5 in. in dia, are available plain or finished (finished OD, faced bosses, spot-centered) with or without lug for revolving handle. Straight handwheels are now available in 6, 8, 10, and 12-in. dia; angular models in 4, 5, 6, 8, 10, 12, and 14-in. dia.

Jergens Tool Specialty Co, 712 E 163 St, Cleveland 10, Ohio

Freon solvents that will remove oil, grease, and dirt without harming delicate metal parts or electrical insulation, yet are safe enough to be used in ordinary work areas, are available in three types: Freon MF, with a 75 F boiling point; Freon BF, which boils at 199 F, and Freon TF, which boils at 118 F. These nonflammable solvents have also been used as heat transfer agents for chilling baths.

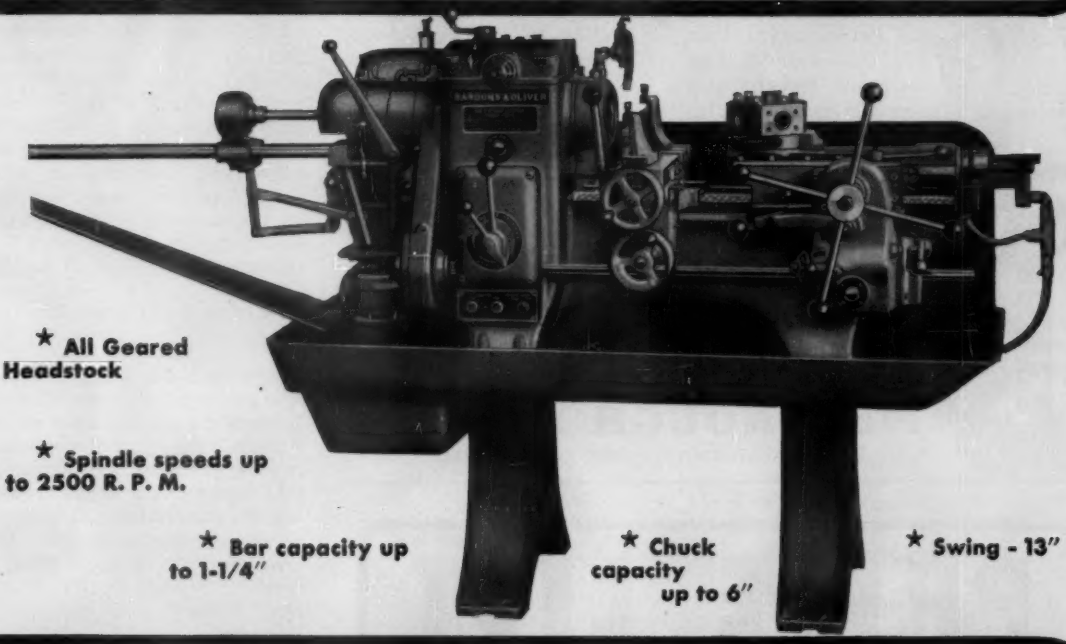
E I du Pont de Nemours & Co, Wilmington, Del

Lithium-base grease trademarked Gulfcrown is a multi-purpose product designed to provide superior lubrication under such conditions as high or low temperature, action of water, high-speed bearing action, and long storage. Grease is available in four consistencies, and is applied by grease gun or through centralized lube system.

Gulf Oil Corp, 1822 Gulf Bldg., Pittsburgh 30, Penna

The BARDONS & OLIVER No. 2 GEARED ELECTRIC

Turret Lathe Handles *BOTH* BAR and CHUCK WORK



★ All Geared Headstock

★ Spindle speeds up to 2500 R. P. M.

★ Bar capacity up to 1-1/4"

★ Chuck capacity up to 6"

★ Swing - 13"

Why buy two Machines ... When ONE will do the Job?.. Check these *Outstanding Features*

Write For New Catalog On Your Company Letterhead

- Only tenths of a second for spindle reversing and two to one speed changing.
- Permissible spindle reversals up to 10 cycles per minute.
- Twelve unduplicated quick speed changes in several optional ranges.
- Instantaneous Dynamic spindle brake.
- Headstock redesigned to deliver 25% more power.
- Automatic spindle reverse and speed change actuated by the operating cycle of the hexagon turret (optional extra).
- Redesigned heavy duty turret slide and saddle for greater accuracy, longer life, and quicker indexing.

Manufacturers of a complete line of Turret Lathes and Cutting-off Lathes

BARDONS & OLIVER, INC.

1134 WEST 9TH STREET • CLEVELAND 13, OHIO

Make accurate set-ups *faster* with this 25° Tilting Spindle

The STERLING Model "G-2" Universal Tool and Cutter Grinder provides this extra feature plus complete versatility and more capacity than comparable machines at *lower cost.*

Swing 10¾" over table, 27" between centers, 18" table travel with 8¼" cross feed. For complete details and specifications write for FREE Bulletin "G-2".

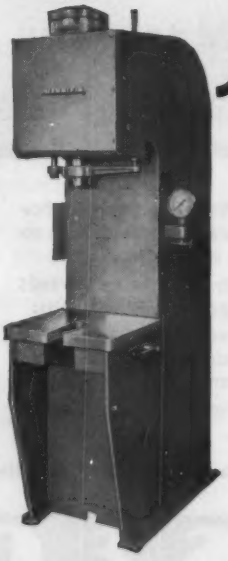
Grind 90° to 140° Included Angle on *ALL DRILLS*, ⅛" to 2½"

No collets or chucks makes set-ups easy. Clearance gauge insures accurate, positive clearance angle. True conical grinding produces full clearance from center to outside. Write for FREE Bulletin "DV-1".

McDONOUGH MFG. CO.
1526 GALLOWAY • EAU CLAIRE, WISC.

PRICE LIST

ON HANNIFIN STOCK HYDRAULIC PRESSES



1-TON, Bench Type	$ 605
2-TON, Bench Type	$ 680
5-TON, with Base	$1,530
8-TON, with Base	$1,605
10-TON, Floor Type	$2,290
25-TON, Floor Type	$3,790

Prices complete with motors and starters F.O.B. our press plant, St. Marys, Ohio, subject to change without notice.

DELIVERY FROM STOCK

Demand for these popular presses is so consistent we are able to produce them in quantity and pass the savings along to you.

Construction-wise and quality-wise these small general-purpose presses are identical to the larger Hannifin presses, up to 150 tons. Special, optional controls when needed.

WRITE for complete information on the Hannifin Hydraulic Press you're interested in.

HANNIFIN
HANNIFIN CORPORATION, 517 S. WOLF ROAD, DES PLAINES, ILLINOIS

NEW SHOP EQUIPMENT

Iron powder low-hydrogen, build-up electrode called Hardalloy 32 is said to deposit a surface that resists extreme impact and moderate abrasion, operates well with either ac or dc welding equipment, and has deposition rate 25% faster than conventional types.

McKay Co, 1005 Liberty Ave, Pittsburgh 22, Penna

Safety center-drills incorporate a radius design which eliminates the sharp notch that is a fatigue point in ordinary plain and bell-type center drills. Model D-400R, available in sizes 1 through 8, is well suited for precision work. Model D-400S heavy-duty type, available in sizes 11 through 18, has a larger contact area for use on heavy parts. Both models reportedly insure higher efficiency through helical relief on the cutting edges.

DoAll Co, Des Plaines, Ill

Heavy-duty Oil Tight pushbuttons are available rated to 550 v ac-dc. Because of standardization and interchangeability, more combinations can be furnished with fewer parts. Line also includes selector switches, selector pushbuttons, pilot lights, and accessories such as mushroom head, lever and key lock. Catalog 5606.

Furnas Electric Co, 1944 W. McKee St, Batavia, Ill

Electrolytic grinding accessories are available to fit company's line of Super Precision spindles. Slip ring on back of spindle carries direct current through spindle to grinding wheel, the wheel acting as the cathode; workpiece, as anode. On wheel end of spindle is a circular sprinkler-spider with hose connection for spraying electrolytic solution at perimeter of wheel. Wheel holder has integral circular well to carry solution in wheel recess. Ball bearings are protected from current by an isolation barrier.

Standard Electrical Tool Co, 2480 W Sixth St, Cincinnati 4, OMio

Indexing table for use with company's Ram Press line of surface broaches uses a 180° index, is manually fed and automatically unloaded. Table features self-locking mechanism actuated by indexing action, and precision alignment.

Colonial Broach and Machine Co, PO Box 37, Harper Station, Detroit 13, Mich

TO SERVE YOU BETTER

Always, at SKF, you will receive unbiased advice

because

– All four basic types of anti-friction bearings are available from **SKF.**

because

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– Their long experience in the widest variety of bearing applications is your assurance of receiving sound recommendations.

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– Thousands of manufacturers have been using the **SKF** Bearing Advisory Service for many years – always with good results. This dependable service is available to you, too. 7754

SKF

EVERY TYPE—EVERY USE

- *Ball Bearings*
- *Cylindrical Roller Bearings*
- *Spherical Roller Bearings*
- *Tapered Roller Bearings ("Tyson")*

"Reg. U.S. Pat. Off. Tyson Bearing Corporation

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.

TO SERVE YOU BETTER

Starrett Announces

THREE NEW HACKSAW BLADES

Distinctively color-identified with easy-to-remember trade names, these new Starrett Production-Proved Hacksaw Blades will give you quicker, cleaner cutting at lower cost per cut. Ask for them by name when you order through your Industrial Supply Distributor.

STARRETT REDSTRIPE® SM
Special Alloy High Speed Steel Power and Hand Blades.

STARRETT GREENSTRIPE® SAFE-FLEX®
Welded Edge Power Blades and Hard Edge-Flexible Back Hand and Power Blades.

STARRETT BLUESTRIPE®
Selected High Speed Steel Power and Hand Blades.

To complete the line, Starrett also offers STARRETT STANDARD All-Hard, Hard Edge-Flexible Back and Semi-Flex Hand Hacksaw Blades to fit all hand hacksaw frames. For complete information, see your Starrett Catalog No. 27 or write for Starrett Saw Catalog. Address Dept. C.

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WORLD'S GREATEST TOOLMAKERS

THE L. S. STARRETT COMPANY
ATHOL, MASSACHUSETTS, U. S. A.

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NEW SAFE-FLEX®
high speed welded edge
HOLE SAWS

Sizes from 9/16" to 6". For cutting Steel, Brass, Bronze, Cast Iron, Aluminum, Wood, Plastics.

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METAL CUTTING BAND SAW COIL
IMPORTANT—The proper selection of the Teeth and the Speed at which the Saw runs will greatly increase the life of Band Saws. Consult the Starrett Band Saw Catalog or Chart for ordering specifications
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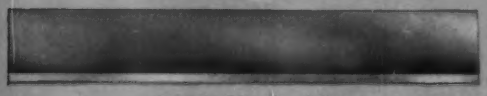
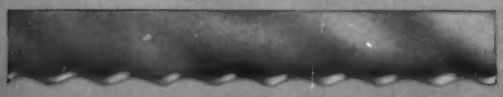
BAND SAWS
In The New Safety Box

METAL CUTTING BAND SAWS
Regular, "Skip Tooth", Spring Temper and Friction Cutting types for all applications.

WOOD CUTTING BAND SAWS
Regular and "Skip Tooth" types for cutting hardwoods, softwoods, fiber, plastics and non-ferrous metals.


Straight-Edge Band Knives

Scallop-Edge Band Knives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Starrett®
Fast-kut
BAND KNIVES

Straight-Edge, Scallop-Edge and Wavy-Edge types — single or double bevel — for cutting soft or fibrous materials. Furnished in coils or cut to length and welded.

ALL WITH DISTINCTIVE NEW PACKAGE AND LABEL DESIGNS FOR...

- Instant Brand Recognition
- Faster Blade Identification
- Simplified Ordering, Stocking, Inventory Control
- Maximum Protection of Contents

Another new benchmaster

specially tailored for wide stock!

benchmaster

FIXED BED, GAP FRAME 2-TON PUNCH PRESS

Here's Benchmaster's latest...a little dandy measuring only 17¼" high, *but packing a 2-ton wallop!* Built with much wider spacing of the columns than usual, it easily accommodates stock 4" wide (feeding front to back) through the 4½" opening...*the ideal press for application to foil and hundreds of fast, light assembly jobs!* Husky construction, adjustable gibs and improved, heavy-duty sliding key-type clutch mean this little giant is *all* Benchmaster, through and through! For your *wide stock, low tonnage problems* ask for details on this and other Benchmaster models ...STANDARD, DEEP THROAT, BACK-GEARED, FIXED BED AND HALF PRESS TYPES in a wide range of tonnages.

Crankshaft at Main Bearings	¾"
Standard Stroke	¾"
Shut Height Bed to Slide, Stroke Down, Adj. Up, Std. Stroke	4⅛"
Other Strokes Available	1"
Shut Height for above Strokes	3⅞"
Area of Bed front to back and left to right	4½" x 7¼"
Bolster Plate Thickness	⅝"
Adjustment of Slide	½"
Hole in Slide for Punch Shank	¾"
Center of Slide to Frame	2¼"
Flywheel Diameter and Face	10¼" x 2"
Flywheel Weight (Approx.)	30#
Strokes per Minute	280-290
Motor H.P. and Speed	¼ HP 1725 RPM
Distance from Bed to Center of Shaft	9½"
Base Dimensions	8" x 8"
Overall Height, Bench Model	17¼"
Size Opening through Back	4½"
Shipping Weight Less Motor (Approx.)	98#

benchmaster

World's largest manufacturer of small punch presses and mills.

1335 West Rosecrans Avenue
Gardena, California

NEW SHOP EQUIPMENT

Service tool set for Roots-type blowers in Detroit Diesel engines is applicable to old and new units. Set, made up of nine components, provides for correct replacement of gears, plates, bearings, seals, and other parts, while minimizing risk of damage to machined surfaces of blower parts.

Kent-Moore Org, Inc, 1501 S Jackson St, Jackson, Mich

Load wheel called Disowheel, for material handling equipment, has tire made of Disogrin, properties of which are said to minimize or eliminate deficiencies common to wheels presently in use. Load-carrying capacity has been rated up to 2000 lb for a 4 x 3-in. wheel. Available from 3 in. in dia to 10 in., and in larger sizes when required.

Greer Industries, Inc, NY International Airport, Jamaica 30, NY

Cartridge heating unit, called Firerod, is reportedly particularly adaptable for high heat-concentration needs of titanium forming dies. Test unit, ½ in. OD by 2¼ in. long, rated at 115v, 250w, which would give it a watt density of 90w psi, has been operated in open air for periods up to 720 continuous hours at a sheath temp of 1800 F.

Watlow Electric Manufacturing Co, 1376 Ferguson, St Louis 14, Mo

Optical scope accessory, Dupl-O-Scope, with fixed-focus, 4-power lens and prism, mounts on the stylus bracket of company's Duplicator to optically sight-in on a master circuit while the company's Fabricator (*AM*—Dec 17, '56, p182) punches a corresponding master templet for printed circuits. External light source is available.

Wales-Strippit Corp, 345 Payne Ave, North Tonawanda, NY

Gasketing material, Kaokork, is a combination of cork, fiber, and rubber that is said to offer effective sealing of rough flange surfaces and frequently eliminates need for expensive machining of castings. By altering ratios of components, materials exhibiting different compressibilities are possible.

F D Farnum Co, Chicago, Ill

Cold galvanizing material called Galvoplate can be applied with either brush or spray gun to any clean metal surface. In areas where cor-

NEVER A
DOUBT WHEN
THE PILOT
LIGHT'S OUT!
Don't guess next time your control line pilot light goes out. Make sure you're using Westinghouse Push-to-Test* indicating lights.
A gentle touch tests the light instantly because an auxiliary set of contacts energizes the bulb. When the light flashes on, you know there is
trouble somewhere else in the circuit.
Shock-resistant, U. S. Navy-type lenses with wide-angle visibility assure the best performance. They are available in crystal, red, blue, amber, green and opalescent—frosted to eliminate false indications.
Push-to-Test lights are only one of many outstanding units in the Westinghouse Oil-Tite* pushbutton line. For further information, ask for the new booklet (B-7022) or the Pushbutton Guide (B-6749), a 72-page catalog illustrating the complete line. Write to Westinghouse, Box 868, Pittsburgh 30, Pa., or call your local Westinghouse distributor. *Trademark
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Speed Precision Boring

and maintain accuracy of .0002" in 12" with the

Kearney & Trecker Model B Autometric Precision Boring Machine

Here it is . . . unmatched for precision boring of small work . . . either single pieces or production lots! Work progresses rapidly on the versatile Model B because multiple boring operations can be completed *in just one setup.* These additional features save time, eliminate errors, and make the rugged Model B easy to operate . . .

Convenient operating controls • Ease of control • Ease of setup • Built-in index table and measuring instruments • Wide range of feeds and speeds • Complete line of especially selected accessories.

Model B Autometric: 16" dia. table; 10" Vert. Travel; 16" Transverse Travel; 15" Carriage Travel; 8 speed changes—.0005" to .0148" per Spindle rev.; 50 to 2500 rpm. For complete details, ask for Catalog No. BMA-10.

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MONTREAL
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Williams & Wilson Ltd.

NEW SHOP EQUIPMENT

rosion has already started it is only necessary to remove loose scale before application. Product is packaged pre-mixed in 1-gal containers.

Danton Corp, 339 Auburn St, Auburndale 66, Mass

Self-fluxing brazing alloy called Alumibraze, supplied as dry powder and applied as an aqueous slurry, is designed for use in molten salt bath to join following aluminum alloys: 2S, 3S, 52S, 54S, 61S, 62S, 63S, 66S, and several types of casting alloys. Reportedly, alloy will not flow prematurely. This aluminum-silicon eutectic alloy melts in range 1070-1080 F, and is generally brazed at 1100 F.

Handy & Harman, 82 Fulton St, New York 38, NY

Electrode and filler rod, Ampco-Trode 40, is a high-strength, ductile rod developed for repair and fabrication of company's Superston 40, a manganese-aluminum bronze casting alloy. Deposits have 95,000 psi ultimate tensile strength, 42,000 psi yield, 26% elongation in 2 in., and Brinell hardness of 170-190. Rod is available as covered electrodes, bare 36-in. filler rods, and spooled wire.

Ampco Metal, Inc, 1745 S 38th St, Milwaukee 46, Wis

Milling cutter, designated RC, for use in high-speed milling with company's Throway carbide inserts, features hardened alloy steel two-piece cutter body, and a locking device to hold insert in place. Available in four styles using square or triangular-type inserts, cutters come in standard sizes and require no special conversion adaptors.

Newcomer Products, Inc, Latrobe, Penna

Welding torch for Fillerarc welding is of dry type and replaces standard water-cooled version. Rated for operation up to 800 amps, new torch is interchangeable in its attachment to an automatic wire feeder, and comes equipped with tips which can handle wire from 0.045 to ⅛ in. Inverted pyramid tip design deflects spatter.

General Electric Co, Welding Dept, Schenectady 5, NY

Nylon bearings known as Snap-In Nyliners have a flange on both ends which retains bearing in hole in sheet metal or thin plates. Helical

How to Meet the PRESSURE ON PRICES

Anthony J. Lucas

METHODS MANAGER, THE CINCINNATI GEAR CO.

When a manufacturer is faced with cost increases, the easy thing to do is to pass the increase on to the customer. We're faced with this temptation just like everyone else. In the past 20 years, our wage rates have risen to over three times their old level; the composite price of steel has risen to about 2½ times the old price; taxes, shipping, equipment costs have all multiplied similarly. But just as we are under this pressure to *raise* our prices accordingly, we are also under pressure from you the customer to keep the price of our product within reason. There is only one way out of this dilemma for us — to improve our efficiency. And that is what we are constantly doing — with new, more efficient machines and equipment, and improved production facilities. Machinery and methods of even a few years ago are inadequate by today's standards of competition. For this reason, if you've traditionally been making your own gears, or obtaining them from a small shop in the neighborhood, we suggest you consult your nearest Cincinnati Gear representative to see how our ultra-modern set-up compares *today* — and find out what we can do for you in the three important categories of quality, service, and price on your custom gear needs.

THE CINCINNATI GEAR CO.
CINCINNATI 27, OHIO
Fifty Years of "Gears — Good Gears Only"

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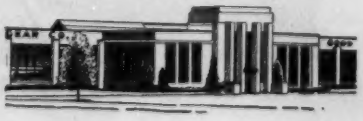


split equal in width to expansion and contraction of material prevents changes in bore diameter, and also allows bearing to be inserted through mounting hole. Bearings come in two lengths, one for plate thicknesses from 0.040 to 0.075 in. and the other for thicknesses from 0.072 to 0.135 in. Bore dia ranges from ⅛ to ¾ in.

Thomson Industries, Inc, Manhasset, NY

Materials handling trucks are now available with dust-resistant construction. Traction and pump motors are totally enclosed; starting and first-speed resistors are mounted in gasketed compartment; and 16-gage sheet steel housing covers main contactors and timing device. Features are available on company's electric-powered riding-high and walkie trucks, both high-lift and low-lift models.

Lewis-Shepard Products, Inc, Dept R4, 125 Walnut St, Watertown 72, Mass

Bit holder called Bit-Caddy attaches to cord of electric drill and holds set of 13 bits, 1/16 through ¼ in. Outer sleeve slips on cord; center section is split lengthwise for easy installation. Price $1.98.

Donart Co, 3921 Xerxes S, Minneapolis 10, Minn

Contact wheel, for use with abrasive belts, is made of new type 3M neoprene and features wider-than-usual lands providing more rubber surface for longer wear. Wheel, designated type X, has slashed serrations, and is available in a 14-in. dia with 1, 2, and 3-in. face widths and in several durometers.

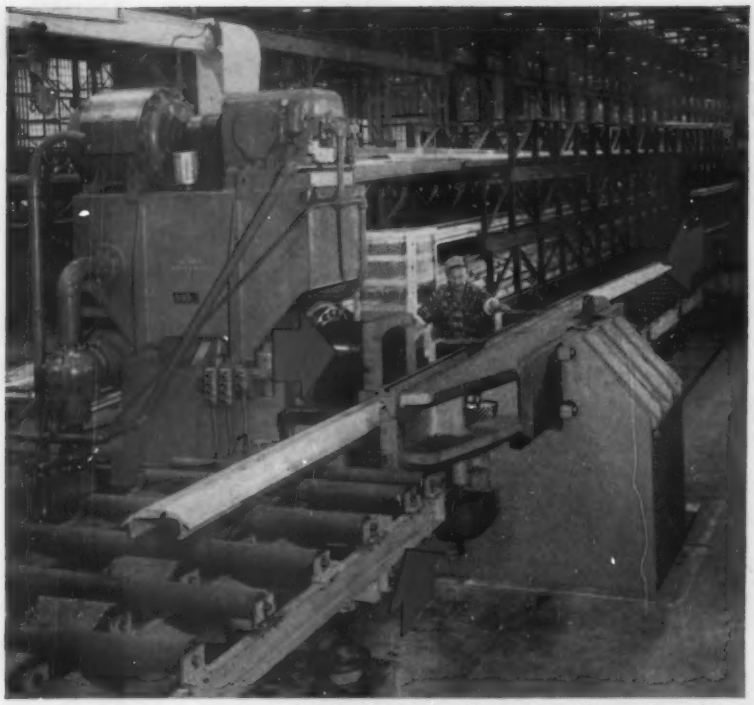
Chicago Rubber Co, 651 Market St, Waukegan, Ill

Beryllium-copper strip, said to be 100% free from surface oxides, is offered in thicknesses down to 0.0005 in., in tolerances as close as ±0.0001 in., and in widths from 3/32 to 6 in. Strip can be stamped in the soft stage and then heat hardened.

American Silver Co, Inc., 36-07 Prince St, Flushing 54, NY

Threading and hobbing tools, made by German firm of Piltz & Sohn, include a line of high precision hobs from 32 to 250 DP, a series of ring and plug gages, micro taps, thread chasers, and knurling tools.

Imported by Eric R Bachmann Co, Inc, 27-11 41st Ave, Long Island City 1, NY



Live-roller conveyor moves work into press. Conveyor moves up or down to position work in die. Ram moves forward to straighten work. Entire installation, including press and conveyor, designed and built by Farquhar.

Kaiser Aluminum uses this Farquhar HORIZONTAL BULLDOZER PRESS for fast-cycle straightening

Aluminum extrusions, fed *continuously* to the press on Farquhar Live-Roller Conveyors, are straightened in a *fast-cycle operation* on this Farquhar 500-ton Horizontal Bulldozer Press. This efficient set-up is installed at the U. S. Air Force Heavy Press plant operated by Kaiser Aluminum & Chemical Corporation in Halethorpe, Maryland. In their own words this press is used "to eliminate natural bows and deformations which develop in some aluminum extrusions after they have been heat treated."

Like Kaiser Aluminum, major plants in this country have found that these Farquhar Horizontal Bulldozer Presses provide high production at low unit cost. Fed either by crane, overhead or in-line conveyors, they are used to economically forge, stamp, straighten or form parts in an efficient, fast-cycle operation.

Write for complete information on Farquhar Horizontal Bulldozer Presses or, better still, ask for our proposals or recommendations.

Farquhar Special Machinery Department . . .

Our qualified staff will build your special machinery economically—your inquiry will receive prompt attention.

A. B. FARQUHAR DIVISION
The Oliver Corporation
Press and Special Machinery Departments
York 16, Pennsylvania

OLIVER Farquhar PRESSES

Also Manufacturers of Farquhar Conveyors

17

....for better FORGING PRODUCTION!

Sharon Open Hearth Quality Forging Ingots — now available in Carbon and Alloy grades, with ingot weights up to 109,000 pounds. Sharon Electric Furnace Quality Ingots — Stainless and Alloy grades, up to 50,000 pounds. • Sharon is also a prime supplier of billets, blooms and slabs — to customer specifications — in Stainless and Alloy grades. For prices — contact the Sharon Steel Corporation, Forging and Semi-Finished Steel Sales Department — or one of the district sales offices listed below.

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SHARON STEEL CORPORATION *Sharon, Pennsylvania*

DISTRICT SALES OFFICES: Chicago, Cincinnati, Cleveland, Dayton, Detroit, Grand Rapids, Indianapolis, Los Angeles, Milwaukee, New York, Philadelphia, Rochester, San Francisco, Sharon, Seattle, Montreal, Que., Toronto, Ont.

for management

When you can't raise prices, you

for production men

This Avey machine is used in a jet aircraft plant on the West Coast for drilling, boring, and spotfacing the flanges and periphery of a jet engine component.

The two Aveydraulic units mounted horizontally have 12″ ram travel. The third Aveydraulic unit, mounted vertically, has 16″ ram travel and a 6-speed gear box with a speed range of 150 to 1800 rpm. The vertical column has an in and out traverse of 20″; moves to a minimum of 15″ and a maximum bolt circle of 55″.

The 60″ Electrodex table is equipped with a master index ring with two rows of bushings, 96, 49, and 8 indexes respectively. The three heads can be programmed to the indexing of the table.

Another example of how Avey combines standard units to meet special production requirements.

for management

You can close up shop, of course, when your primary customer puts the lid on your price at the point where you run out of profits. You can look for another customer. You can try another market where the customers are more reasonable. But these are all expensive cures.

A more realistic approach is to take preventive action now. For every pound of cure, you can invest an ounce of capital in Avey production machines which can reduce your operating costs immediately. Then you can meet your customer's demands and stay in business.

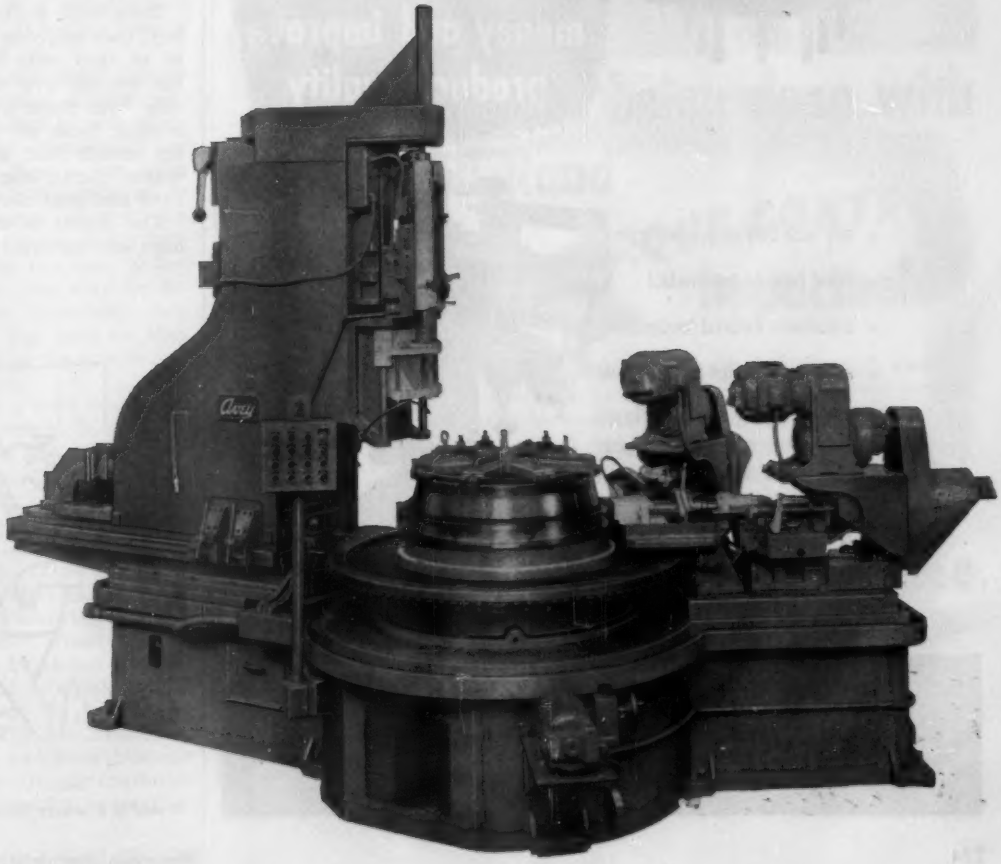
If your replacement reserves are limited, you can finance Avey equipment on a pay-as-you-produce plan. In many cases, Avey machines have returned their original investment so quickly that they earn clear profit within a year.

THE AVEY DRILLING MACHINE CO., CINCINNATI 1, OHIO

drilling, tapping, production machines

can still make profits

Avey



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- any size bolt or screw!
- hand held or automatic!
- maintains desired torque!
- as many spindles as you want!

Contact an Ingersoll-Rand AIRengineer now . . . he's your link with a world leader in automatic assembly machines.

8-521

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11 Broadway, New York 4, N.Y.

ROUND TABLE Discussion

VIBRATING NERVES

Is it possible for a worker to become accustomed to the noise of his own machine, yet be bothered by the sounds of a less noisy machine next to him?

SOUNDS and our reactions to them are many and varied. Some are pleasant and welcome; music, a song, the voice of a loved one. Others are awesome and greeted with fear; squealing brakes, a shot, a scream in the night. The greatest portion of the sounds we hear and react to lie between these extremes, like the rumble of a train in the distance, the swish of rain underfoot, or the gentle clink of the fork against the dinner plate.

Most of the sounds that reach our ears are received and accepted without particular recognition or notice. They are routine, and our attitude towards them is a neutral one.

Then there are the sounds that annoy; they rasp our nerves, and grate us as they pass. We dislike them but we can live with them for we only hear them with our ears. Exceeding these are the piercing, biting sounds that we hear with our whole bodies, the sounds that hit hard and hurt deeply.

The degree to which a sound annoys and disturbs is not exclusively

"I said is it always this noisy out here!"

a function of the volume of the sound. Sounds that annoy one person may not annoy another. A sound can be such that it is disturbing to all who hear it, yet the person creating it is not disturbed by it in the least.

Experiments have shown that noise has a definite effect on our working efficiency. These tests have also shown that noise bothers well adjusted persons more than the poorly adjusted.

Noise is a serious problem and it is growing worse all the time. Studies of the effects of noise have revealed that noise increases the blood pressure, quickens the pulse and upsets the normal rhythm of the heart.

The noise problem is the enigma of our times. Science has labored to increase people's joys but every new invention seems to add a new noise. The solution is in reduction rather than in elimination. Perhaps the answer lies in automation which will permit operation from a remote location.

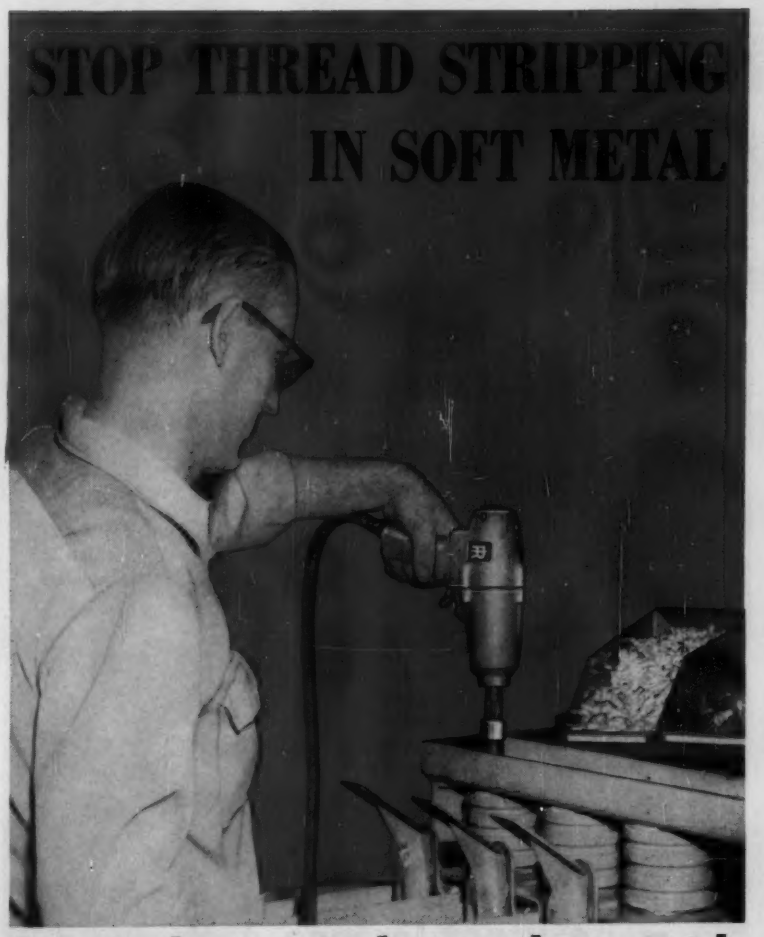
Sing Yen
Brooklyn, NY

I THINK Ritter may have got used to the noise of his own machine and will not notice it if he has been a long time on that job.

It is surprising how many routine noises we don't notice. A loud ticking clock in an office is completely unnoticed for long stretches of the day. A healthy person who is a sound sleeper will promptly go to sleep without being aware of the tick of the alarm clock in his bedroom. People who live near to factories or railway lines may be disturbed by the new noises when they first hear them, but later on they grow accustomed to the sounds and forget about them.

I think Ed should walk warily and make no hasty decision. To help him make up his mind, he has his knowledge of Ritter to go upon. Being his foreman, he must know something about him. If he is inquisitive he will know practically all there is to know about him. If he is merely observant, Ed will have a very good idea of Ritter's character, his virtues, and his vices. From Ed's remark about him being out to make trouble, I'm afraid Ritter should not be taken quite at his face value. There's many a slip, you know, and it is always an awkward business rehabilitating the wrongly convicted.

I favor Al's suggestion to get Har-



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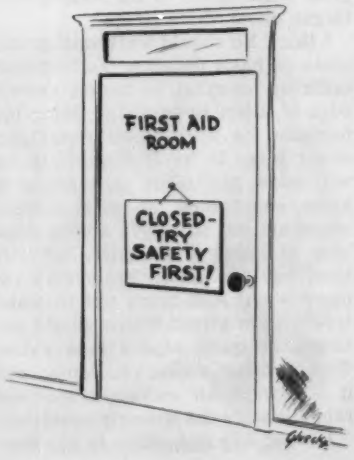
rison to bring in a noise expert. There's always the off chance that the grouser may one day have something legitimate to grouse about. This may be Ritter's day, who knows?

By taking his grouse seriously and thoroughly examining it from all angles, the interests of the company will be protected against the charge of neglect, that king-pin of all compensation claims. The noise expert ought to be able to suggest some way of damping down the excess of noise at the new press. By all accounts, Ritter is working a press which is almost as noisy, if not more so, than the new machine. If his own press has not wrecked his health, it is highly improbable the new one will do it much harm. On the other hand, the new noise may be the last straw. Because of the noise, Ritter may have been working under strain on his own machine, and may now feel that breaking point has come with the new noise. Beyond agreeing on the noise expert suggestion, there is little more Ed can do but observe Ritter's behavior, the quality of his work, and the amount he puts through.

If those points are all satisfactory and normal, Ritter's real trouble, if he has one, might not be the noise of the new press and it could be a case for medical examination. A foreman can't say a man hasn't got a nervous condition if he insists he has. Smart malingerers have beaten the experts on that ground before and have drawn undeserved compensation. If the noise expert and the doctor can't give Ritter relief, Ed's only course is to offer him a move from the press shop to quieter surroundings. Such a move might not benefit him financially; he'd have to



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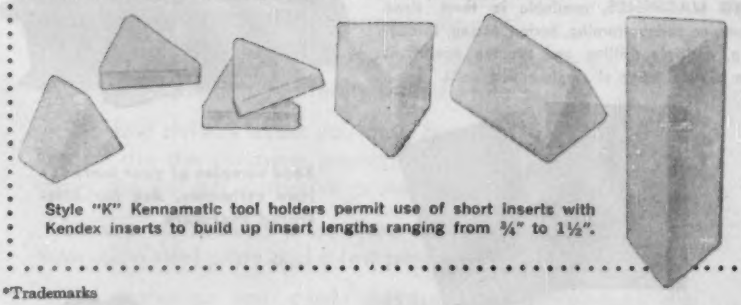

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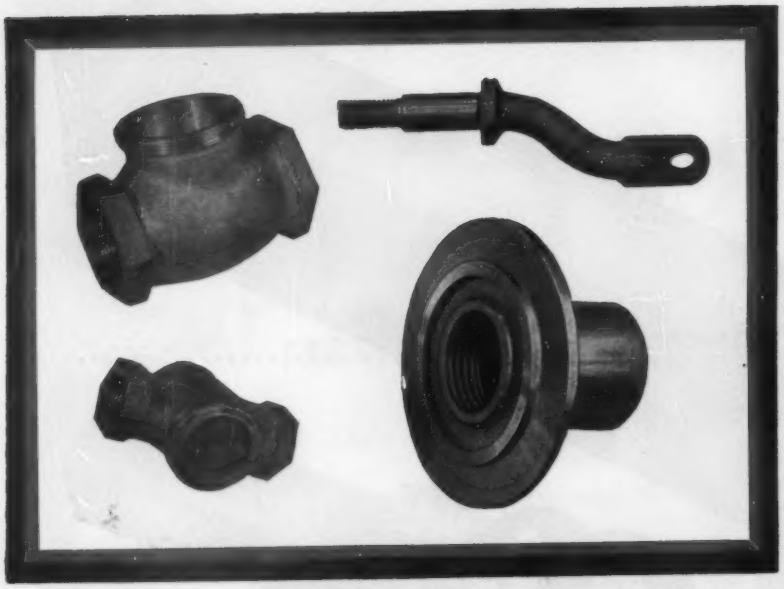

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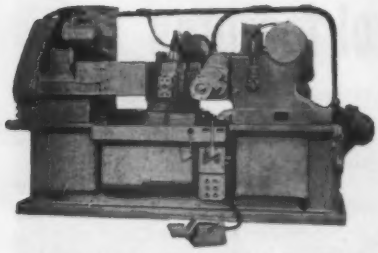

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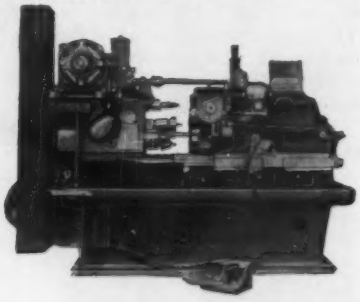

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take a chance on that. That would be one way of calling his bluff, and bluff cannot be ruled out.

There may just be something in Al's ideas that noises aren't all alike in their effect on certain people's nerves. They are all much the same to me, although I don't like a noisy machine or a noisy shop. The noise of the new machine may have an upsetting effect on Ritter while a louder noise might not. If that is the case, a press shop is the wrong place for him.

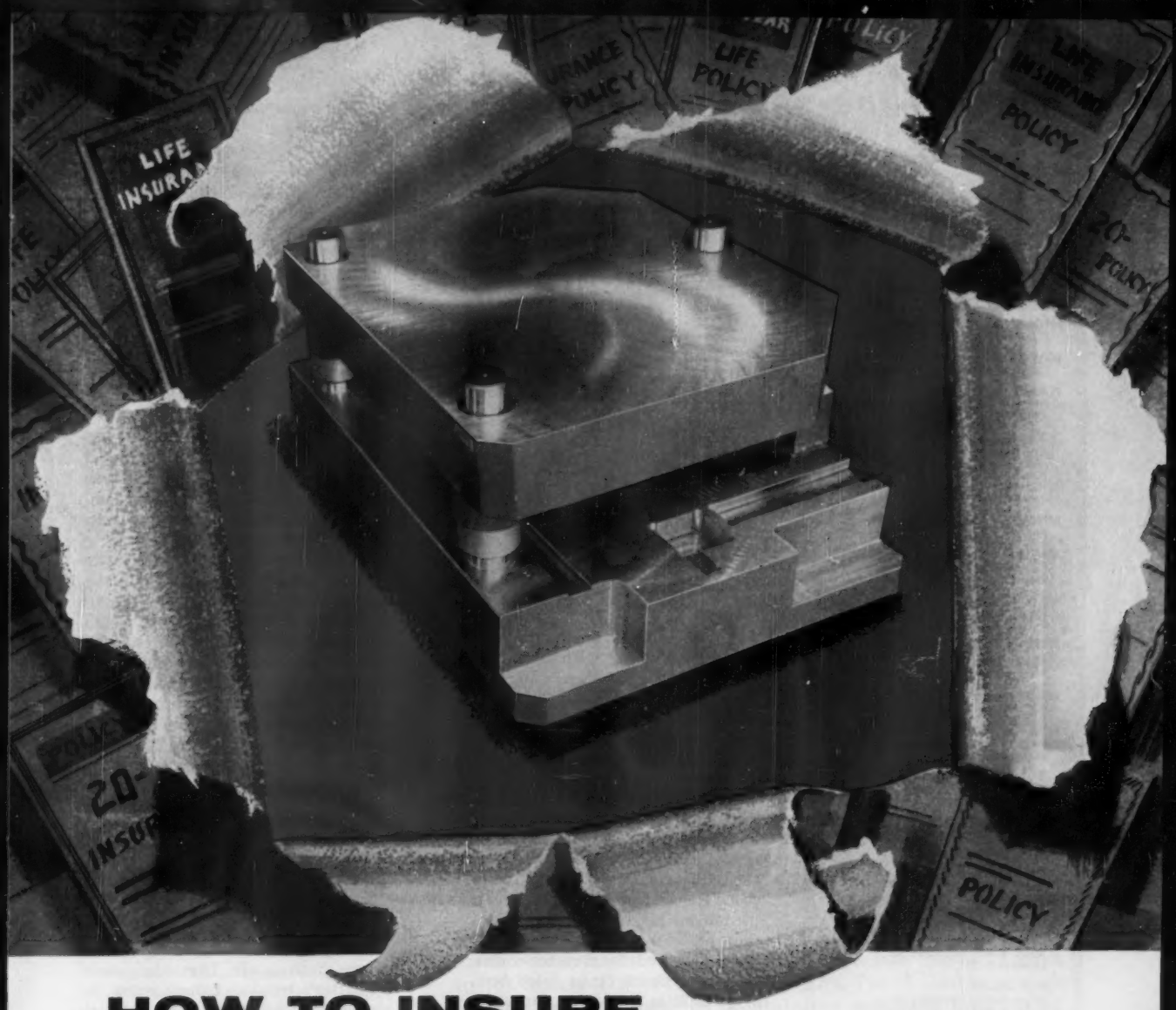
This is one of those irritating cases. It's like a crossword puzzle, too many alternatives. It involves noise experts, doctors and psychologists. The cautious way would be to enlist the help of all three and act on their advice. That is a lot of trouble to take over one man who may not know his own mind. It is not the most direct way but if there is no clear proof of cussedness on Ritter's part, it is the safe way, and he would have no comeback on the company for compensation.

I J Parkinson
Northants, England

A NOISE needn't be loud to be a plague to the nerves. Some people cannot concentrate in a room with typewriters in action. Ritter may be acutely sensitive to the particular noise made by the new machine. His nerves may be all of a jangle under the impact of the new noise, yet almost unaffected by the noise from his own press, to which he may have grown accustomed through long usage.

It is not quite cricket to argue that

"It's a souvenir of my vacation."



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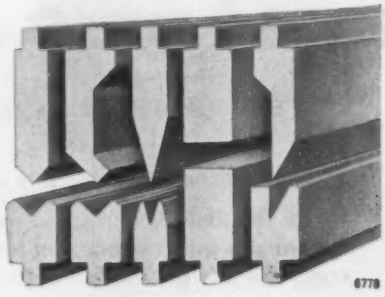

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the new press cannot affect Ritter's health because his own machine is noisier, and hasn't had a bad effect on his nerves. Perhaps it is the kind of noise, the quality rather than the volume, that makes the difference. That is understandable, because a high-pitched sound, often repeated, will be more annoying to most nervous people but not to all, than a low-toned sound, and that is where Ritter's grouse may be said to hold water. No foreman or manager, not even the doctor can prove to Ritter or to himself that Ritter is imagining things, or that his nerves are not suffering from the noise complained of. Ed's jealousy idea could have something in it. That could be Ritter's real trouble and his complaint about the noise of the new press a bit of eyewash.

An idea would be to put him to operate the new press and note the results. If the new noise was actually fraying Ritter's nerves it might be because his own machine needed so little attention from him, due to his familiarity with it. His concentration could, in that case, be directed to the strange noise from the other machine, to the dislike of his nervous mechanism. Ritter working the new press, his attention fully occupied with operating an unfamiliar tool, and his jealousy forgotten in the new satisfaction, might be a very different person indeed. Some men can't see a new machine without wanting to operate it and, if things don't work out that way for them, some are not above finding a sour grapes fault to air. That, also, could be Ritter's trouble. I don't think Ed should can Ritter, at least, not till

"Take a rumor about laying off men to increase production."

he has tried more commonsense methods. The heavy hand should be the last resort; that can be applied any time. Al's idea of Ed asking Harrison to call in an expert on the subject of annoying din in the shops seems good to me.

I have known only one somewhat similar case, the cause of which was almost certainly psychological. It concerned a woman examiner who worked in a medium-size machine shop. She had been happily employed at this work for some years when she asked to be moved. That was going to be most inconvenient for the foreman, who naturally asked why she wished a move. Strangely enough, she seemed not to have any clear idea of why. She just seemed to have grown nervous and afraid. A doctor interested in fear complex was asked to interest himself in her case. In a remarkably short space of time he laid the ghost. Investigation by the doctor revealed the fact that as a very young child she got a bad fright from an injured bat falling on her face, when sleeping in a cot on the veranda of her parents' house. Later, it transpired, a few bats had established themselves in the eaves of the machine shop. The doctor held that while the woman had never seen the bats in the shop her subconscious mind reacted to their presence and caused a sense of fear and uneasiness. When the bats had been destroyed, the woman settled down, happy and confident.

Ritter's upset may be psychological in respect to noise quality, or it may be envy, not because the new press is noisy but because he would like to operate it and has not been asked. As a matter of interest, the grouse is worth some close examination.

If that gets the company nowhere, I suggest Ritter be put on the new press. It may be found he is so occupied with making it hum, he won't hear the noise he now objects to. If the noise expert decides that the noise from the new machine is really upsetting Ritter, a move from the press shop is indicated, unless some means of minimizing the racket can be found.

J C Ball
Stranraer, Scotland

It is very common that the fault we frequently find in others is the one that is most prevalent in our own personality.

This seems to apply in the case

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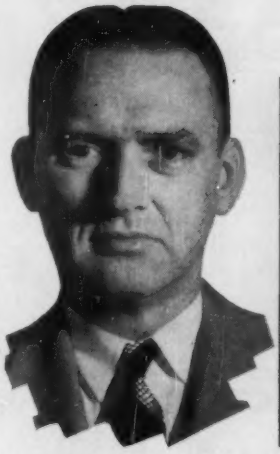

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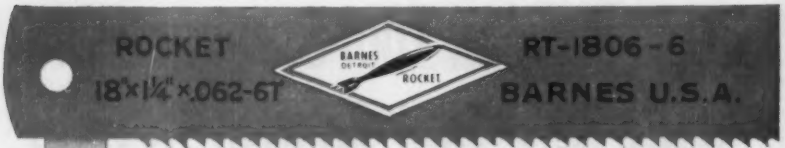

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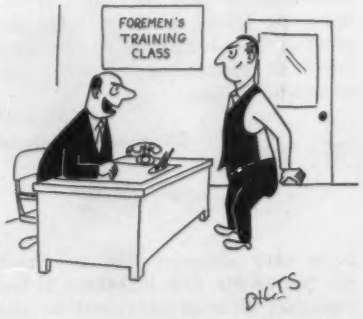
concerning the noisy machines. Before Ritter passes judgment he should analyze his own operating procedures. Perhaps he keeps the motor going continuously when there are times that it could be shut off without any inconvenience. If he initiated this practice he might then call on his co-workers to follow his example, but hardly before. One machine cut off for five minutes wouldn't make much of a difference, but when a number of noise makers are halted at once, or even at staggered intervals, a shop is more on the way to sounding like a small-town depot rather than Grand Central Station.

One candle in the darkness doesn't give much assistance, but a room full of lighted candles makes a difference. So, too, with noise. Everyone's cooperation is needed to make the working picture pleasurable.

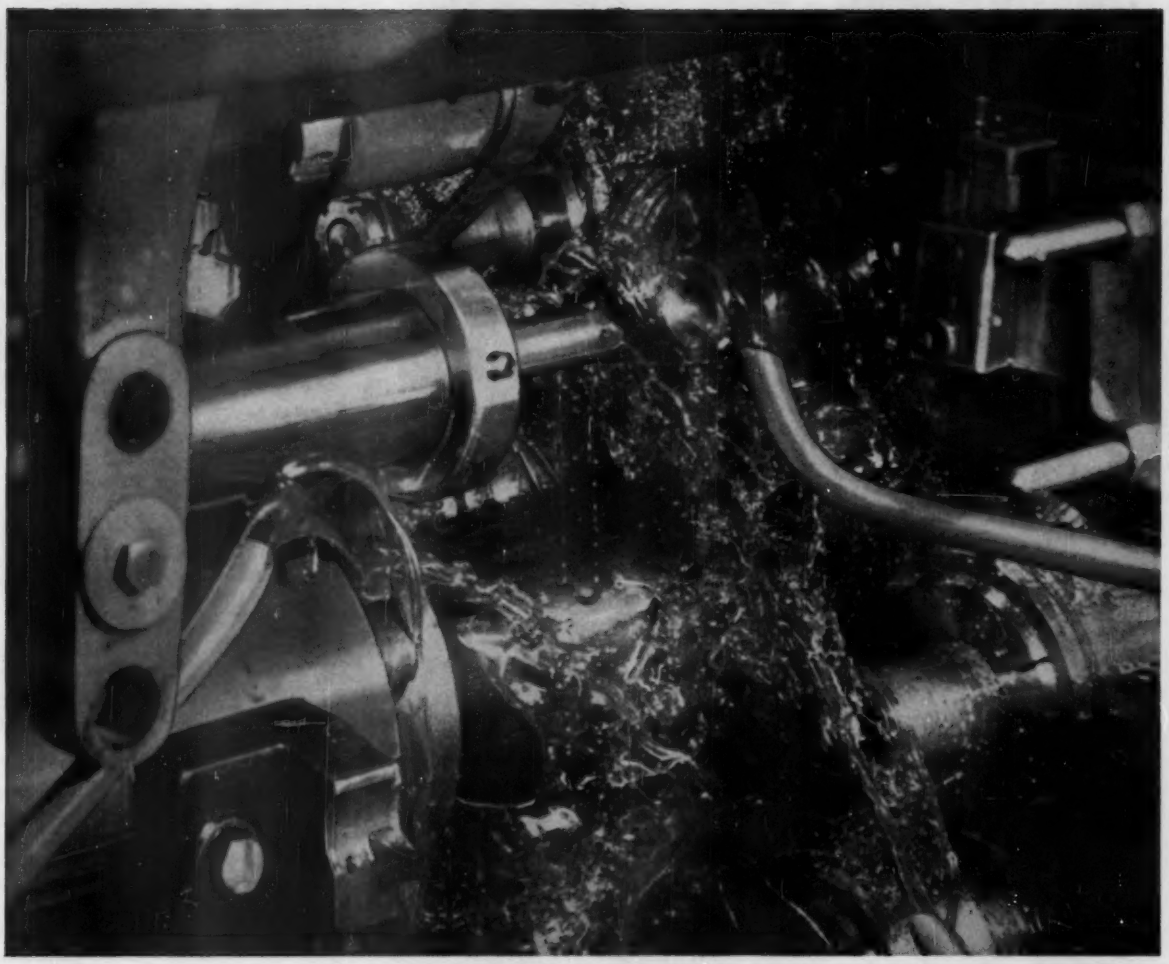
Perry G Conway
Philadelphia, Penna

NOISE and its reaction on people is a strange thing. The human nervous system has yet to be mastered; why people object to certain sounds which appear to be less noisy than the machine they operate is just another funny fact. Yet it is well known that individuals sometimes will have nervous breakdowns just due to the same sound which penetrates the mind and reacts on the nervous system. An oldtime criminal punishment was the sound of constantly dripping water. Yet other persons can work where the noise level is very high and never, apparently, notice the sounds.

Long applications of high noise level will damage the hearing and eventually cause deafness. Thus we see that a problem does exist not only from nervous strain but also



"You've got the snort down fine, but get a little more practice on the snarl."



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from injury to the hearing. This is why the state health departments are beginning to realize that noise control is a must and that it is as vital as general safety when it is applied to persons working in industry.

Naturally, sound and noise are difficult to describe. It is not always possible to draw a line between normal sounds and harmful noise. Here again the individual plays an important part. All people are not built alike when it comes to sound reactions. Some find a shrill continuous noise not at all distracting or even noticeable but it will rate high on a noise meter. Thus many studies are underway to try to establish what is harmful noise. Once this has been accomplished then a definite pattern can be set to judge all noise found in industry today.

Perhaps Ritter, who has worked for years on a punch press with the slow, dull thud and a clatter of the dog in the clutch, finds this new, high-speed, more or less continuous punch press very distracting. The noise level is entirely different and the rapid repeating no doubt interferes with his mental thinking and thus his subconscious mind begins to show signs of break down. If Mr Ritter is justly making a claim, and no doubt he is, then not only is his nervous system becoming upset, but also he may start to lose coordination of mind and hand. This would cause a mental lapse and it is during these periods that people lose fingers and hands in punch presses. It has been known that operators who have operated presses for years without an accident will suddenly lose a finger or worse. What happens? Why should this man after all these years get his hand caught in the press? We claim it is mental fatigue or a mental lapse due to some distracting occurrence. Perhaps a dis-

"Either it's a crap game or some one's fainted."

turbing home condition or even a new noise that bothers the subconscious mind.

Let's face it. Noise is dangerous, and something must be done to reduce the intensity and deaden it. How can it be accomplished? This is a subject in itself and each problem must be solved within the area in which it exists. No hard-and-fast rule can be set because so little is really known about noise and its reactions on people. Let those who deal in noise reduction work on your problem. It is not yet a "do-it-yourself" type of problem that you can personally solve.

Charles D Townsend
West Hartford, Conn

ANY HIGH-SPEED PRESS makes a lot of noise, which might affect some person's nerves. But if this occurs, such men can be transferred to another department where the noise is not so loud. So why not move Ritter to some quiet place, Ed?

I don't believe that he is squawking as Ed says if his own press is the loudest in the whole shop. However, if two noisy machines are placed side by side the noise is increased tremendously. So, after all, perhaps Ritter has a good reason to complain. But under no circumstances should he be canned. Instead he should be complimented for calling attention to the unpleasant sound.

Ed and Al are wasting time when they discuss Ritter's gripes; the problem is not solved thereby. Why not do something about the noise instead? Different kinds of noise might affect men differently, but one that disturbs the nerves of anybody in any shop should be investigated. If it is higher than 80 decibels, there is reason enough to go to action and see what can be done about it, even if nobody is complaining.

Ed is not serious when he says that he might have to separate all the presses from each other at least 500 yards. He knows this is not a practical solution of this problem. Ed and Al should be glad they don't have a lot of drop hammers around; they used to be the real noise makers.

Al's suggestion that Ed should check around and hear what the other operators think is a sound idea, because that might reveal that Ritter is not the right man to work under

(Continued on page 238)

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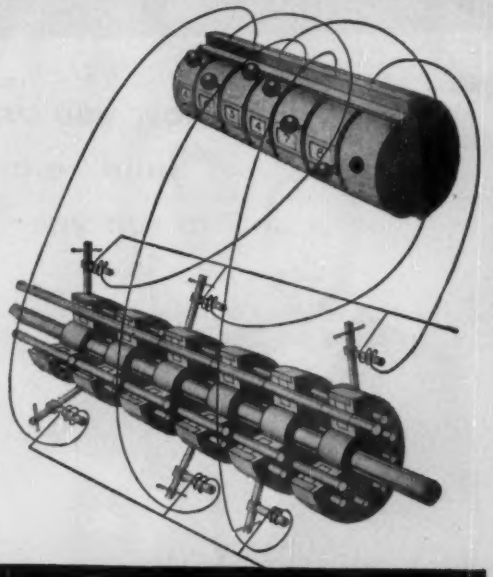

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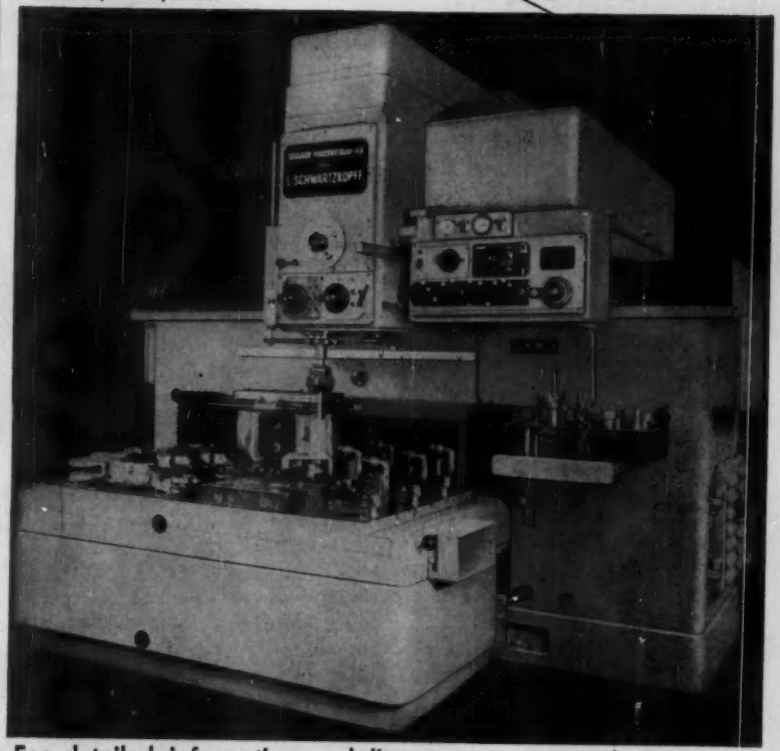

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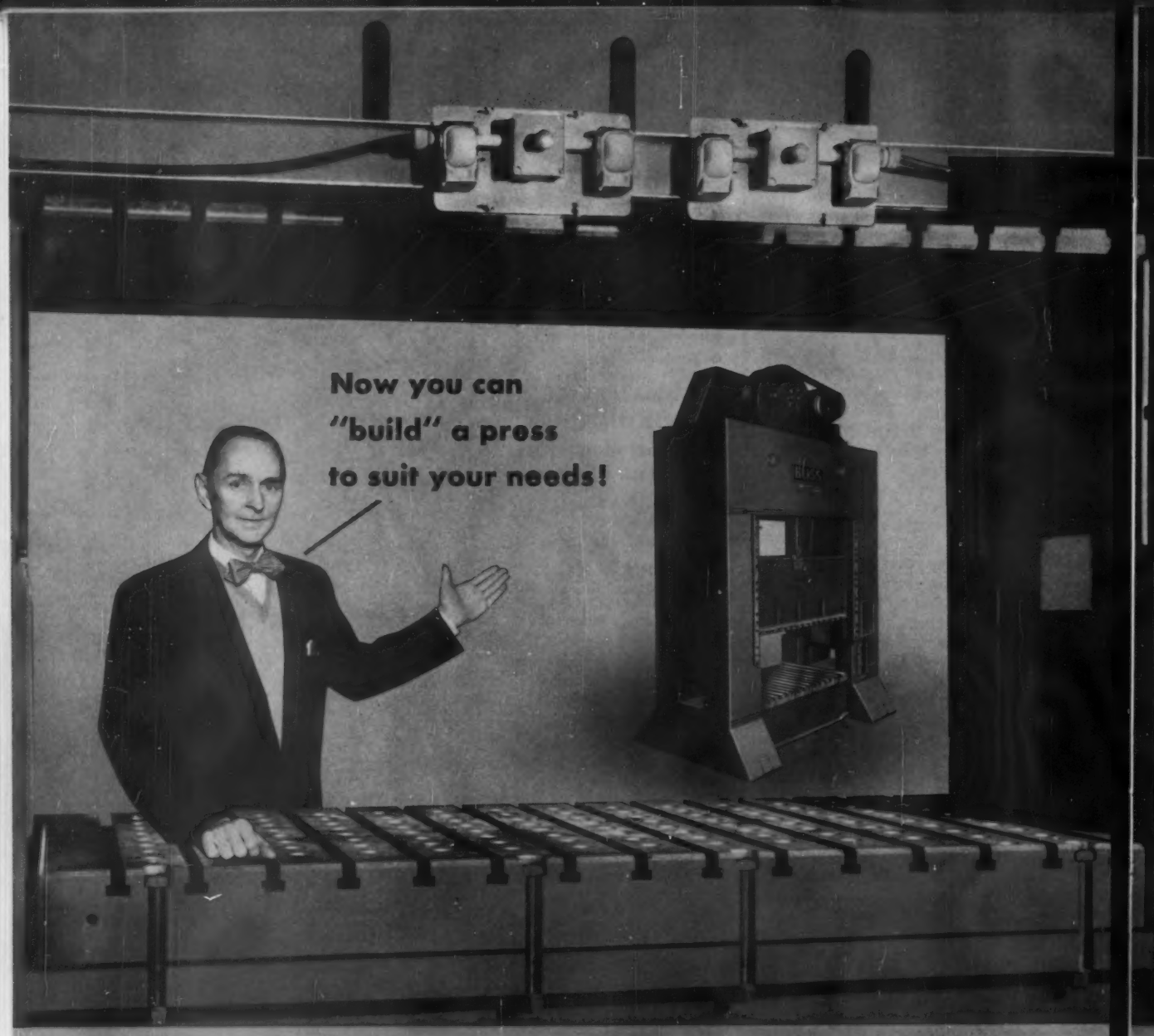

Why buy a press designed for someone else?

To these basic design advantages of the new Bliss SE-2 press . . .

- Enclosed design, all-welded construction, four-piece frame with tie rods drilled for electrical shrinking
- Recirculating oil system for gears, shafts, bearings, slide adjustment and *flywheel roller bearings*
- Bronze liners on the slideways running against lubrized cast iron gibs
- Motorized slide adjustment
- Counterbalance tanks
- JIC sizes
- Anti-friction bearings on *intermediate shaft* as well as on flywheel

. . . you can add any or all of these optional features

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- Recirculating oil to the cushion gibs
- Automatic lubrication to counterbalances and cushion internals
- Air and electrical maintenance outlets
- Die lights
- Air control manifolds
- Special controls

A Bliss Chief Engineer tells...

How press buyers can "tailor" Bliss' new eccentric-gear design to fit their own needs!

"It's almost impossible to design a large press to please everyone. Yet that's exactly what we have tried to do with our new one point, two point and four point presses," says Chief Engineer Bill Staecker, of Bliss' Canton Plant.

"Here is how we approached the problem. Our field sales engineers worked for months with customers' operating executives and our press designers. On the one hand were the widely varying requirements of the big automated mass-production stamping plants; on the other, the needs of the job shops who use their presses for short runs. It was rare to find two sets of requirements alike.

"Flexible" design proves answer

"It was apparent that what was needed was a *flexible* basic design—a press that could have features added or subtracted to meet any user's needs without making him pay for features he didn't want. You can see how we have solved the problem by looking at the table of specifications at the left.

New drive cuts maintenance

"But...above and beyond the benefits of this basic design, these new Bliss presses have a 'unitized' drive mechanism based on a special *demountable* flywheel and outboard clutch. To get an idea of what this unitized design does for maintenance, consider these facts:

"Except for the main gears, nothing is built into the crown. The entire drive can be removed as a unit. Belts can be replaced without removing anything but the brake pins. And the entire clutch can be taken off simply by removing the brake bracket.

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noisy conditions. Or they might support Ritter's gripes as being justified.

Ear plugs of good quality are useful, but not enough. Management should think of the noise when they purchase new machines and stipulate to the manufacturer how much noise will be tolerated. Sometimes gears make a lot of noise, but this is easily prevented by using pinions of fibrous material. This should be demanded before any new machine is ordered.

I don't think a high-speed punch press makes enough noise to hurt anybody's eardrums, but in order to prevent litigation it is best to be careful about any presumptive damage.

There are many things that might be done to quiet a press. A remedy to prevent the noise from spreading in the whole shop is to suspend large boards of masonite from the ceiling all around the noisy machines. If there are several presses in the same room it might pay to sound-condition the whole room including the ceiling.

A E Fristedt
Stockholm-Bromma, Sweden

VACATION RIGHTS

Should employees be required to work a full year before they're eligible for a vacation? Would it be practical to allow them to take it in seperate days as they become eligible month by month?

In order to arrive at a decision as to whether or not a new man, who has been on the job but a few months, has any vacation rights we must first consider the relative values of the

"No, you don't have to go over these reports tonight . . . all depends on how bad you need your job!"

dependable employee, who has put in years of conscientious effort toward the successful growth of an organization, and the fickle-minded roamer who flits from job to job without any thought of his obligation toward the success of the organization for which he works.

The success of the firm—its effective production schedule as well as the thought-power put into its operation—is uppermost in comparison to the many things secondary in status to the proper functioning of an efficient element of production. These are the things of importance that the flitterbug looks upon with disdain. He plugs along in his own satisfied way so long as he gets what he considers is coming to him. We must evaluate the worker in reference to the sound contribution he makes toward the successful operation of the plant.

While vacations are given to the employees for the express purpose of maintaining proper physical and emotional balance, they must be handled in a business-like manner so as to be effective to each and every member of the plant. There must be some reward, besides increase in pay, for unselfish loyalty and conscientious service. How can one determine these qualifications when a man has been employed for only a few months?

Even though there is a system of handling vacations in Sweden, as Al was led to believe, which grants a worker a vacation whether he is on the job for one month or a year, it doesn't mean that such a scheme would be effective here in America. I can readily see where such a plan would work effectively if there were 100% cooperation among the employers. This arrangement would, of course, be between manufacturers of similar product. No doubt one would find chiselers in any combine as is evident relative to apprenticeship which primarily takes into consideration the replacement of skilled workmen. This selfishness of some to acquire needed skilled workers at the expense of the unselfish employer who maintains an excellent system of training would naturally be practiced by the Simon Legree of production were not an elaborate check imposed whereby all would cooperate.

So far no mention has been made about vacation rights to be enjoyed by the employer. His rights should be considered also. We are all aware of the abuses of vacation time taken by some workers. The impression that vacation time is entirely the worker's business and that he can

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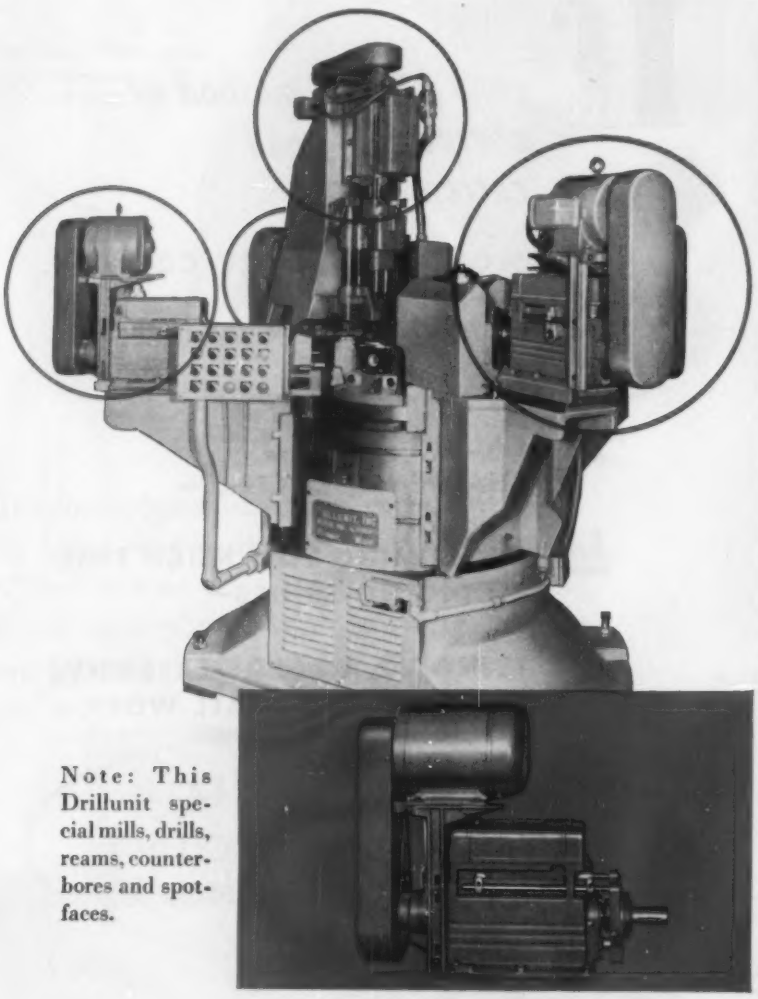

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do whatever he wants to with it is a question not agreed to by all concerned. Is it right for one to abuse the privilege of renewing his body and mind and ignore the rights of the one who gives him the time? Were the worker to cooperate with the idea of what a true vacation means he would make every effort to rebuild his body and mind during that time so as to return to his work feeling completely rested and in a happy frame of mind. Is Bill Snyder right from the standpoint of fairness when he starts out from the shop with his toolbox and deposits it on the bench of another firm for the purpose of, as he says, "raking in a few extra shekels"?

Let us not consider vacation time as a give and take proposition—the employer gives the time and the worker takes advantage of him by using up the time to promote his own selfish ends. Let the worker do the right thing toward himself, by conditioning his body and mental faculties, and fitting himself for renewed efforts as he returns to his work.

Rex Warren
Waterloo, Iowa

THE PROBLEM of vacations and who is entitled to them has always been with us and stems from many sources. Employees are paid at frequent intervals, usually weekly or bi-monthly; however, this does not mean that the employment policy is on an equally short-time basis.

Employees are generally hired with the intention of keeping them and with the hope that they will stay for the long term. The vacation is part of this plan. The usual plan

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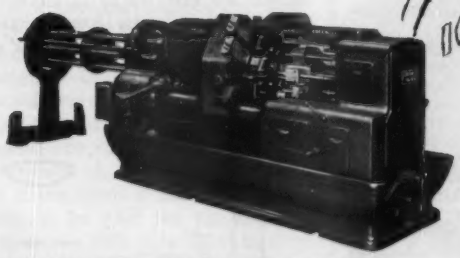

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of two weeks off for each 50 worked is fair and equitable.

The company would be glad to give an employee the vacation at the beginning of his year instead of at the end if they could be sure he would complete the year. A plan could be developed which would allow a vacation just after starting work and would provide a penalty if the employee left before the year was up. Such a plan would be difficult to operate and would lead to confusion and problems.

The plan used in Sweden to give everyone two weeks' vacation each summer regardless of when he might change jobs is possessed of many shortcomings. Sweden is a small country, highly socialized, and such a plan can be applied without great difficulty. In this country there is a great disparity between sections of the country and between individual companies. In some areas and in some companies the vacations are most generous, while in others the reverse is true. A nation-wide plan could satisfy but a few; there would be objections by both the employees and the companies. Would the company granting three-week vacations reduce it to two to conform with the plan?

There are many seasonal trades and industries where no vacations are given at all. It is far better to leave this matter in the hands of the individual companies.

Many companies have adopted a very fair, yet simple, plan. They grant one day's vacation for each month worked, up to 10 days. Thus any employee who has worked 10 months gets a full two weeks' vaca-

"Had a close shave crossing the street this morning."

tion. Under this plan employees who start in the spring can earn a few days vacation by the time the summer months arrive.

The present system is the result of years of experience; it works well and should be left as is.

Sing Yen
Brooklyn, NY

THE RULE in which an employee receives so much time off with pay after being on the job for a certain specified length of time has been established in industry for a good many years. To me this seems a fair arrangement. However, it has its drawbacks in the event a man in changing jobs finds himself deprived of vacation because he hasn't put in a certain amount of time while on his new job.

In asking for time off to go hunting or fishing I feel that the new man has legitimate reasons but the granting of this time off is dependent upon whether it would interfere with the production schedule. The man may feel that he should be granted the time off because he doesn't expect pay while absent. However, when a man undertakes to fill a job he should consider that his obligations to the firm precede his desire to hightail it into the woods or patiently awaiting the arrival of the winged unfortunates as he sits in his blind. Should an employee desire to participate in these sporting orgies he should make his application sufficiently ahead of time so as to enable the foreman to make arrangements for another to takes his place during his absence so as not to interrupt the production schedule.

Should one run into an individual who insists on taking time off to revel in the smell of gunpowder, and expects to be paid for his absence, just preserve that individual in alcohol for posterity to gaze upon as a good specimen of unbridled gall. How times have changed from the "good old days" of the full dinner pail wherein one had to work to fill it.

If my memory serves me right we used to take off two weeks and our pay did not go on while we were lolling on the sands of joy. Those were the days when the employer took the narrow-minded attitude that it was up to the worker to look out for his own interest. If the worker failed in health he was dumped and replaced by a more healthy specimen. Fortunately the employer now feels

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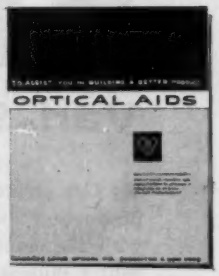

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that it is to his interest to see best of health. Some individuals are hard to please and think that their own interests are the only ones to be considered. The person who inquires as to just when he will get a raise and when does he get a vacation is primarily looking out for his own interest. I don't blame a man for getting all he can while the getting is good but he should face the fact that his own efforts alone depend upon the rewards he will re-receive.

I cannot go along with Jorgenson's idea of giving a man vacation time regardless of his length of service. The purpose of the vacation idea is to contribute to the worker's physical and mental health as well as to have it act as an incentive to reduce turnover. In order to do justice to the senior employee who has been a regular contributor to the firm's success by years of honest endeavor, and to successfully deal with the situation brought up by Al relative to the man who has recently been employed and who desires to go off on a shooting toot, I have the following suggestion which may already be in force somewhere about the country: That the employee be given a day of leave for every month of service and that this time be increased proportionately until at the end of two years' service he be given three weeks of time off with pay.

One of the most progressive industrial establishments to my knowledge whose success, to my way of thinking, in keeping amicable relations between employee and employer, was the originator's (Mr Patterson) consideration for the welfare of his

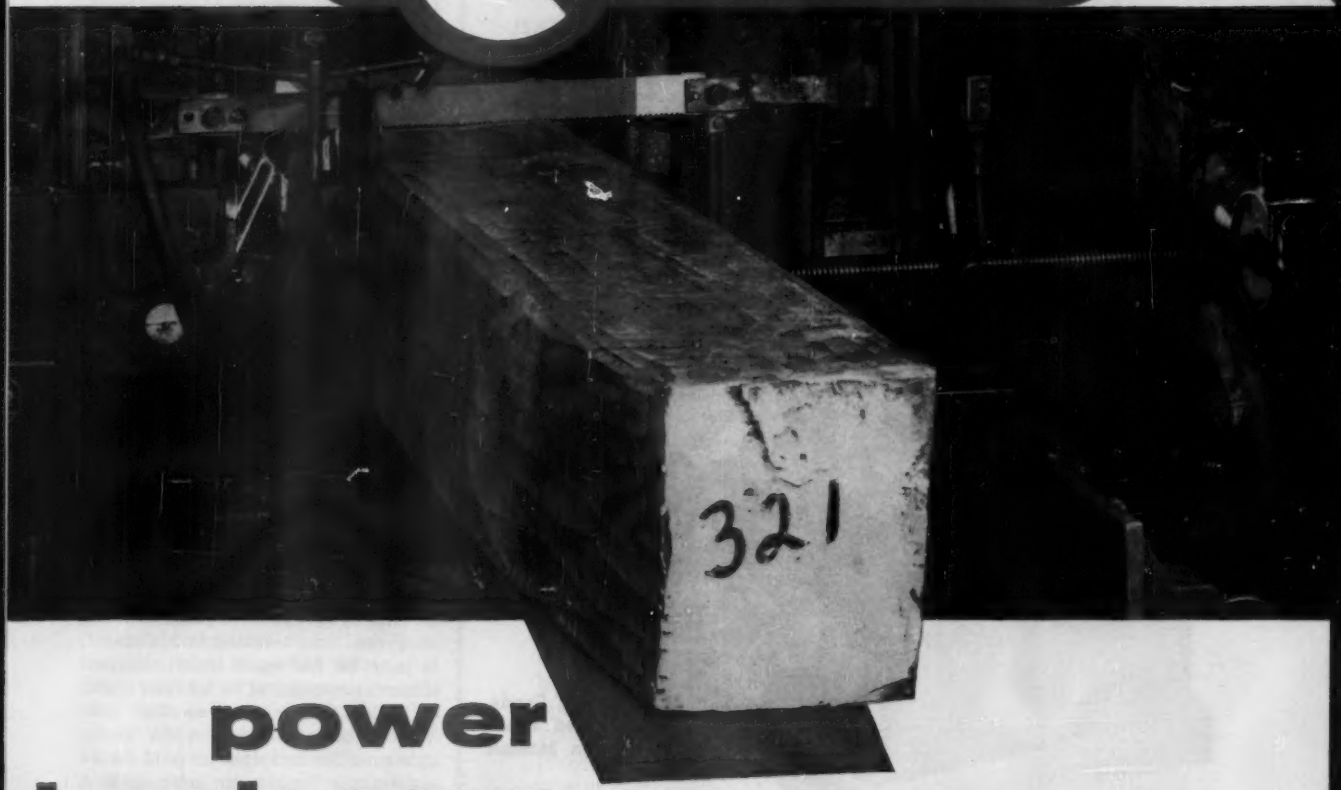
"That has got to go!"

Fortunately the employer now feels

cut it with

stop

1881 CAPEWELL



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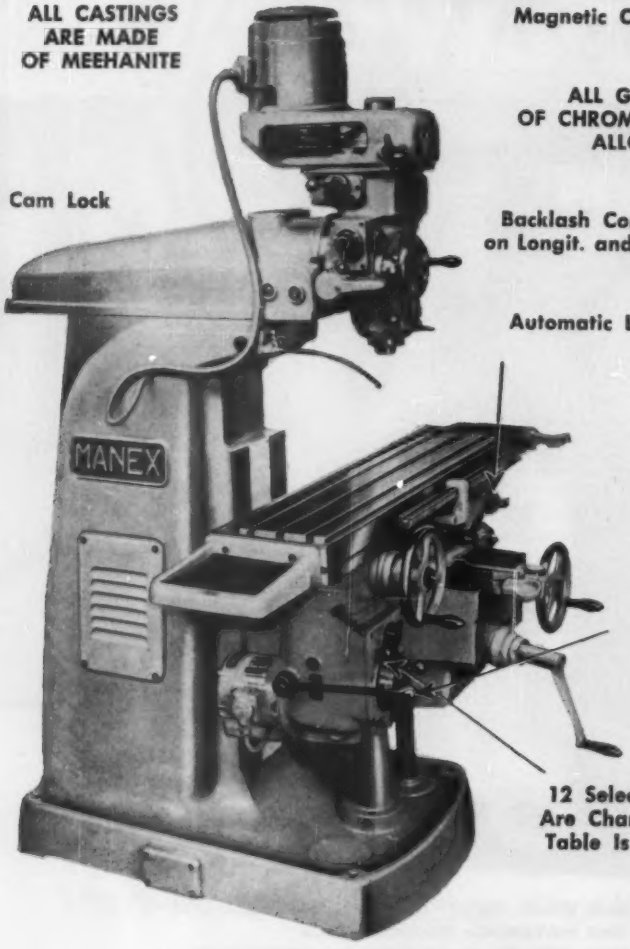

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SPECIFICATIONS

TABLE	36" - 42" - 48"	Electro-pump	¼ H. P.
Longitudinal feed	26" - 30" - 38"	Maximum distance spindle to table	18"
Width	10"	Maximum distance spindle to column	23"
Cross feed	10"	12 DIAL TYPE table feeds	7/16" to 19⅛"
8 Spindle speeds	75-2850 r. p. m.	RAPID TRAVERSE	100" p. m.
3 automatic feeds	.0015" - .003" - .006"	Micrometer depth stop graduated in .001"	
Quill travel	5"	Large dials graduated in .001"	
Head traverse travel	13"	Brake inside pulley stops spindle instantly	
Motor for Spindle	2 H. P.	Motor and pulley dynamically balanced.	
Motor for table feed	½ H. P.	Net weight (approx.)	2750 Lbs.
Saddle	30"	Base	40" x 25"

MANEX

MACHINERY CORPORATION

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employees. He never made a move for the firm's advance that did not consider the advance of the workers' interest. I had the pleasure of spending the summer months, many years back, in working as a draftsman at the Dayton plant in order to brush up on modern procedure in drafting practice and, incidentally, in gaining a modern viewpoint of production advancement. (Although I did not acquire any so-called credits for my effort I did acquire a damn good education for the period spent. If educators would evaluate a person's progress by what he has learned instead of how many credits he holds I could see some sense to it.)

After I was on the job for six weeks I was offered a couple of days vacation! Inasmuch as my period back east was for the express purpose of acquiring information pertaining to advancement in manufacturing methods I spent those two days down in Cincinanti visiting the American Tool Works and the Cincinnati Milling Machine Company. I appreciated the chance to visit these plants while on pay with the National Cash Register Company. I came back to California filled to the brim with knowledge of great value which I relayed to my boys in my engineering drawing classes.

Regardless of the time of year that an employee leaves his job, he should be given time accrued to his credit. It may be for some reason beyond a man's control that he leaves a plant in order to take on another job. Were he to be on the job a few weeks or a month when deer or wild ducks are on the legitimate loose then a problem presents itself. Obviously a man who has the call of the wild in his blood just has to let the world go by as he follows the trail to bag his game. Fortunately for manufacturing output every man does not

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yearn to kill at certain seasons of the year but as things are some provision should be made for those who do.

You can bank on it, Mr Foreman, when a man is looking down the barrel of his gun he isn't thinking of a better way of doing a certain job; his blood surges through his tired veins with renewed vigor and he returns to the lard oil and chips a better man to carry on—maybe he'll reward you with a couple of fat mallards!

John Homewood
Laguna Beach, Calif

LET US take a new approach to vacations and the rights of all employees. For years companies have built up the present idea of making an employee wait for a vacation. In fact there is no regular waiting period. Some companies say one day for each month after 90 days, starting after July 1st. This actually means that a man could get a vacation in December of four days but these companies then state that no company vacations are to be taken after October 1st of each year. Thus the most a man can get starting to work in April of a year is 2 or 3 days. This does serve to give a new employee a little break.

Other companies state that their vacation plan gives one week after one full year of continuous service and two weeks after the first five years of employment. In fact in looking over the plans of vacations and vacation pay there are almost as many of them as there are companies to use them.

Management has given vacations and their significance little heed over the years. The top group of management take off when they want to, and stay away three or four weeks at a time. Their workers get perhaps a maximum of two weeks. Oh yes, some companies are bighearted, and after 10 or 15 years of service you get one extra day for each year of service.

All these ideas are naturally planned and plotted to get employees onto a payroll. They are designed to give only what has been demanded. If we wonder why labor is so rough on companies sometimes; it has been necessary because of management's own ideas on the subject. Don't mistake this comment that unionization is the answer to all problems because it definitely is not. It fails, just as management does, to get to the heart

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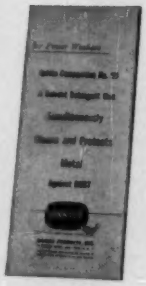

2. Stripping pigmented paints—*with no need for pickling before repainting.*

Oakite Rustripper saves money in paint shops by doing a complete stripping job in one operation. It eliminates extra pickling and neutralizing to remove the metallic pigments, phosphate coatings and rust that prevent successful repainting.

A television manufacturer says "We formerly took 25 minutes to strip rejected cabinets, then had to pickle to remove tarnished phosphate coatings. Today 10 minutes in Rustripper strips the same cabinet so bright and clean you can't tell it from new. Eliminates pickle, neutralize and rinses."

An auto parts maker uses Rustripper for continuous conveyor line stripping. "Cycle of 1 minute and 50 seconds works like a charm stripping paint and incidental rust from rejects and hooks."

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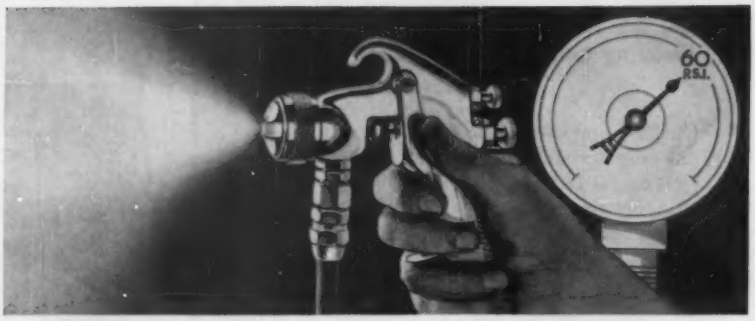

Paint sprayed cold with high atomizing air pressure often looks like this.

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This means increased paint mileage, heavier film build where needed . . . all at a savings of up to 50% in materials!

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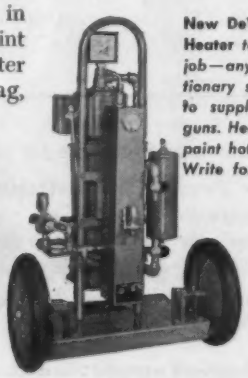

New DeVilbiss Portable Paint Heater *takes hot spray to the job—anywhere! Complete stationary systems also available to supply single or multiple guns. Heat-jacketed hose keeps paint hot right up to the gun. Write for Bulletin IE-114B.*

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of the problem. Unions are big business and business is dealing with human beings and their welfare. Yet today most of the unions have become so large and wealthy that the big bosses care little about the worker so long as the organization runs smoothly and they can personally reap the rewards of exceptionally high salaries and retirement benefits.

Organized labor has been developed because of unfair labor practices and because individuals themselves could not buck the blacklisting that occurs between companies.

But we are concerned about vacations and the workers' rights to have such vacations. Let's consider the problem this way. Every worker is entitled to a vacation each year. This applies only to those people who are continuously employed for fifty weeks each year. Thus we eliminate those drifters who want to work eight to ten weeks and then loaf and collect unemployment insurance.

Of course, recognizing that today we are approaching the time when no worker has the right to work unless he is a union member, this plan is aimed to stop the curtailment of an individual's rights of decision and to give to the worker a new conception of work and play.

In essence the plan would insure that every employee or employed worker for the last fifty weeks would get his vacation regardless of job changes. We would suggest that a plan be set up similar to unemployment insurance where every company in a state pays into a state fund a set amount of money dependent upon the number of employees. This would call for the establishment of a state vacation commissioner to ad-

Photo courtesy of the Barber-Colman Company

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ministrate the plan. All workers in

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GEO MET RIC

ministrate the plan. All workers in all companies would receive a vacation of two full weeks at set times dependent upon the industries and their relationships to the other factories and business.

True enough, this is only an idea but with proper planning it is definitely workable and it could accomplish the end motive . . . that of giving all workers a fair break on vacations and the benefits that the vacations bring without penalizing them in order to protect companies against the perpetual drifters. It would give to the workers more benefits than they can now obtain.

Charles D Townsend
West Hartford, Conn

I THINK we are all convinced that any man who works steadily for fifty weeks of any year is entitled to the remaining two for rest and recreation.

However, it was not ever thus; many of us can remember when the privilege of taking a vacation was reserved exclusively for the top brass and a few selected key men and office workers. The shop man took a vacation on his own time and at his own risk—if the boss took a notion to fill the vacant spot during the vacationee's absence it was just an illustration that, contrary to the old saw, absence does not always make the heart grow fonder.

I can remember working for one old codger, and round about May this particular year work began to grow slack. Having a few extra dollars and a hankering to see Niagara Falls I approached the old boy and asked permission to have two weeks off—at my own expense, of course. He grudgingly assented, after about two days' deliberation and a curtain lecture on thrift, plus the information that his own vacation for forty years had consisted of a one day visit to Boston each year to see the Red Sox in a double header. I can remember the salty comments of the gang at washup time that night when I related my story of the encounter. One oldtimer pithily expressed the opinion that the "old so-and-so" wouldn't spend a nickel to see a certain famous statue in New York Bay perform a natural function. Anyway, I had my vacation and a most enjoyable one, and not long after the old man was gathered to his fathers. I doubt very much if the Red Sox noticed the loss in their annual gate receipts.

Since then, of course, vacation

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with pay has become an established fact for the lowly shopman and is likely to remain fixed procedure. Not having travelled in Sweden and knowing nothing about working conditions there, but knowing the Swedes in the United States and having considerable respect for them as mechanics and intelligent hardworking people, I am inclined to favor the idea of transferring a man's unused vacation period along with his services to a new company. If the Swedes can make it work there is no reason why we can't.

The idea that the oldtimers would be opposed to the change is as completely wrong as the theory that because a job has been done one way for years it becomes standard practice and cannot be improved. I worked for the government when an employee had to work a full year before being eligible for one day's paid holiday. Now a new employee, in this particular branch at least, starts earning his vacation when he starts work. For example, if his annual leave is fifteen days a year, at the end of one month's service he would be entitled to one and one quarter day of leave. This change, instead of being opposed by the oldtimers, came about mainly through their efforts over the years in overcoming the objection that it was against standard practice and would cause "too much bookkeeping." We all know what happened when Social Security was first suggested in this country. Now we have an administration that is generally conceded to be, if not business-minded, at least "middle-of-the-road," and they, in this year of grace, have seen fit to give it their blessing and indeed liberalize it.

Time changes our thinking in many different ways, and ideas that bordered on absurdity when first expressed have now become accomplished facts . . . To my mind, however, there is nothing absurd in the idea that a man should be able to transfer his unused vacation time along with his toolbox to a new company. Frequently, there is considerable hardship financially, for the new man who joins a company just before the plant closes down for the annual vacation as many plants do. Not being entitled to vacation pay on account of the one year waiting period, he is obliged to sweat out two weeks without salary and, as we all know, if he is a family man there is an economic necessity to "keep it coming." I'm for a vacation plan, Swedish style.

Robert S Alexander
Glastonbury, Conn

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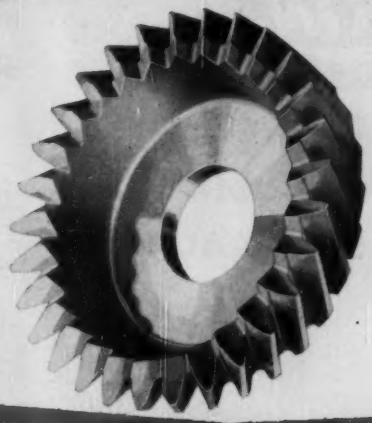

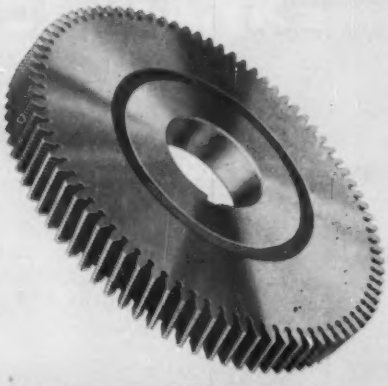

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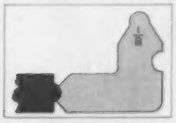
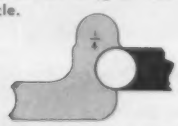


3. Determines convex radius near projection that prevents use of gage as in views 2 and 5.

4. Checks any concave radius that is ½ or less of circle.



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MECHANICAL WORLD ELECTRICAL YEAR BOOK. *Published by Emmott & Co Ltd, 31 King St W, Manchester 3, England. 359 pages 4 x 6. Price 50¢.*

The 1957 edition contains a section on the development of thermal storage heaters, together with material concerning regulation of electrical equipment in buildings, details of electrical cables, and certain tests useful in the installation and maintenance of industrial electrical equipment.

•

NFPA BUILDING EXIT CODES (13TH EDITION). *Published by National Fire Protection Association, 60 Batterymarch St, Boston 10, Mass. Pamphlet. Price $1.00.*

The aim of this standard is to help minimize danger to life from fire, smoke, and panic by establishing standards for the construction, arrangement, and use of exit facilities in public buildings. The code has been approved as an American Standard by ASA.

•

HYDROGEN EMBRITTLEMENT AND STATIC FATIGUE IN HIGH-STRENGTH STEEL—*By R D Johnson, H H Johnson, W J Barnet, and A R Troiano. Published by Office of Technical Services, US Dept of Commerce, Washington 25, DC. Report No PB 121064. 41 pages. Price $1.25.*

Previous investigations into delayed failure and hydrogen embrittlement in high-strength steel under commercial electro-plating conditions were extended and the results correlated. Temperature dependence of delayed failure time indicated that crack propagation was controlled primarily by inward diffusion of hydrogen. Initial embrittlement introduced by cadmium plating equalled that introduced by standard hydrogen charging conditions. Plating showed powerful influence in delaying recovery.

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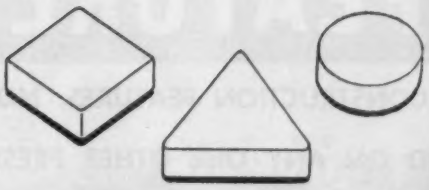

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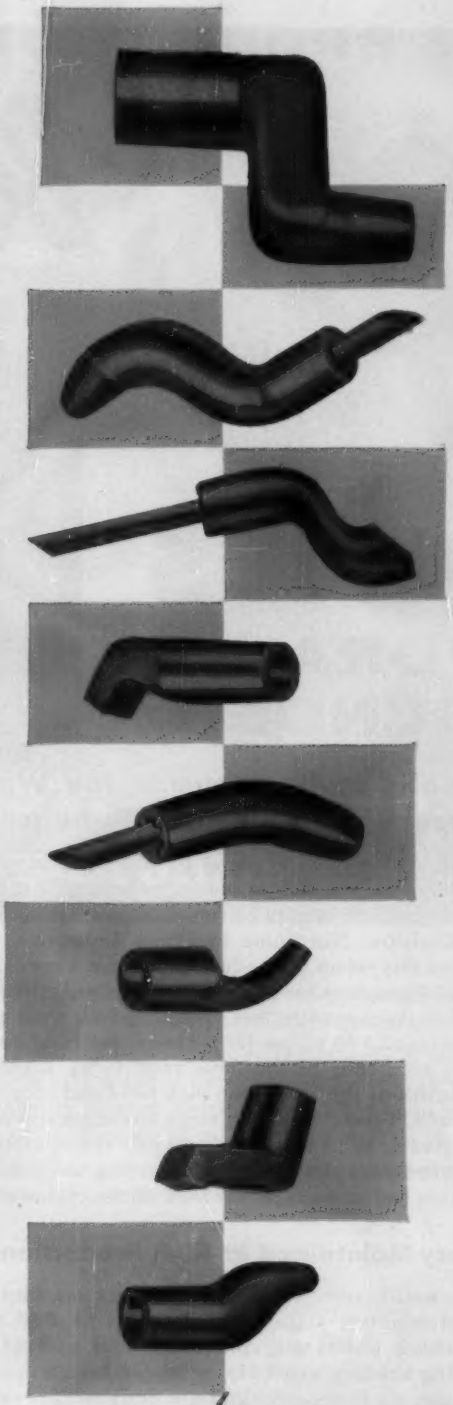

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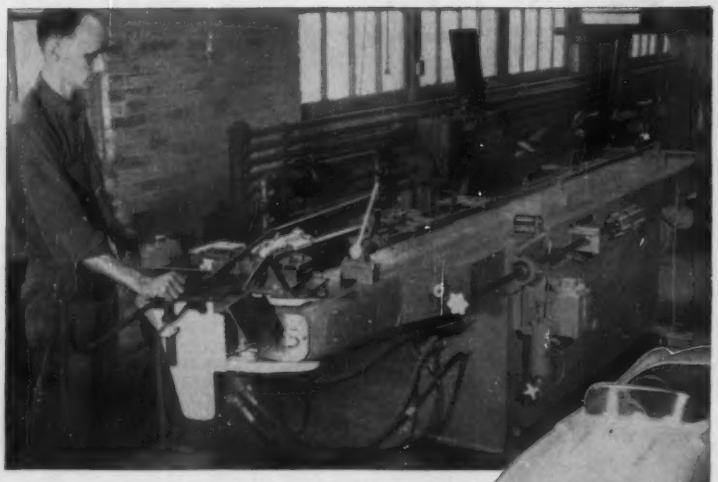

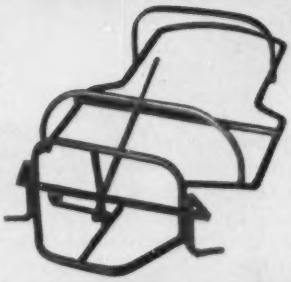

Over-all view of Pines Size ¾ Bender at Flexsteel Spring Division used for outside job work as well as for their own manufacturing needs. Application illustrates setup for bending long side members for toy Corvette car.

Automatic Cycling Speeds Job Work for Flexsteel Spring Division - Dubuque, Iowa

Here's another typical example of fast, efficient production bending illustrating the outstanding advantages of automatic cycling, a standard feature on most Pines machines. Flexsteel Spring Division, Northome Furniture Industries, Dubuque, Iowa, used this set-up to produce frames for a toy Corvette car from ⅝" 18-gauge welded steel tubing. Records show that over a period of three months, net production on workpiece illustrated averaged 140 pieces (840 bends) per hour. On this job requiring six bends of the same radii (1 13/16"), the operator simply positions the tubing for each bend and presses the forward button. Pre-set indexing stops automatically control the angle for each bend in sequence while the operator rapidly positions the workpiece. Automatic cycling saves valuable production time and accounts for the high efficiency rate maintained.

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Simple positioning gauge determines plane of each bend. View shows position for making sixth bend for right-hand frame member. Both right-hand and left-hand members are produced on same setup.

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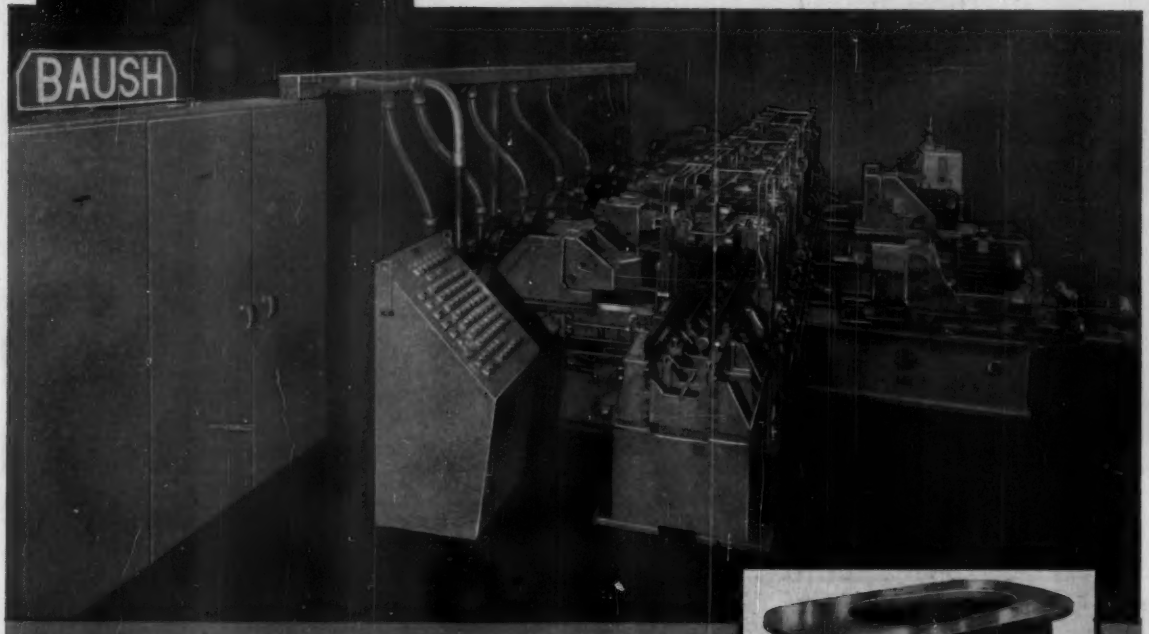
- 1 Unloading Station

The transfer line is made up of 4 Horizontal Hydraulic Slide Units and 5 Horizontal Mechanical Leadscrew Units having 9 Fixed Center Heads equipped with a total of 32 spindles.



Operations performed are: Mill, Drill, Ream, Countersink, Chamfer and Tap. Individual leadscrew spindles are used for tapping and lubrication is by air-oil mist.

Production is 62 Transmission Cases per hour, or 1984 operations, working at 100% efficiency.

If it is rugged reliability, accuracy and economy of operation you are looking for in single purpose multi-spindle machine tools, then you want BAUSH MACHINE TOOLS.

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And we thought we were getting

Machine shops everywhere are finding that new high production goals can be set after trying

ANTISEP
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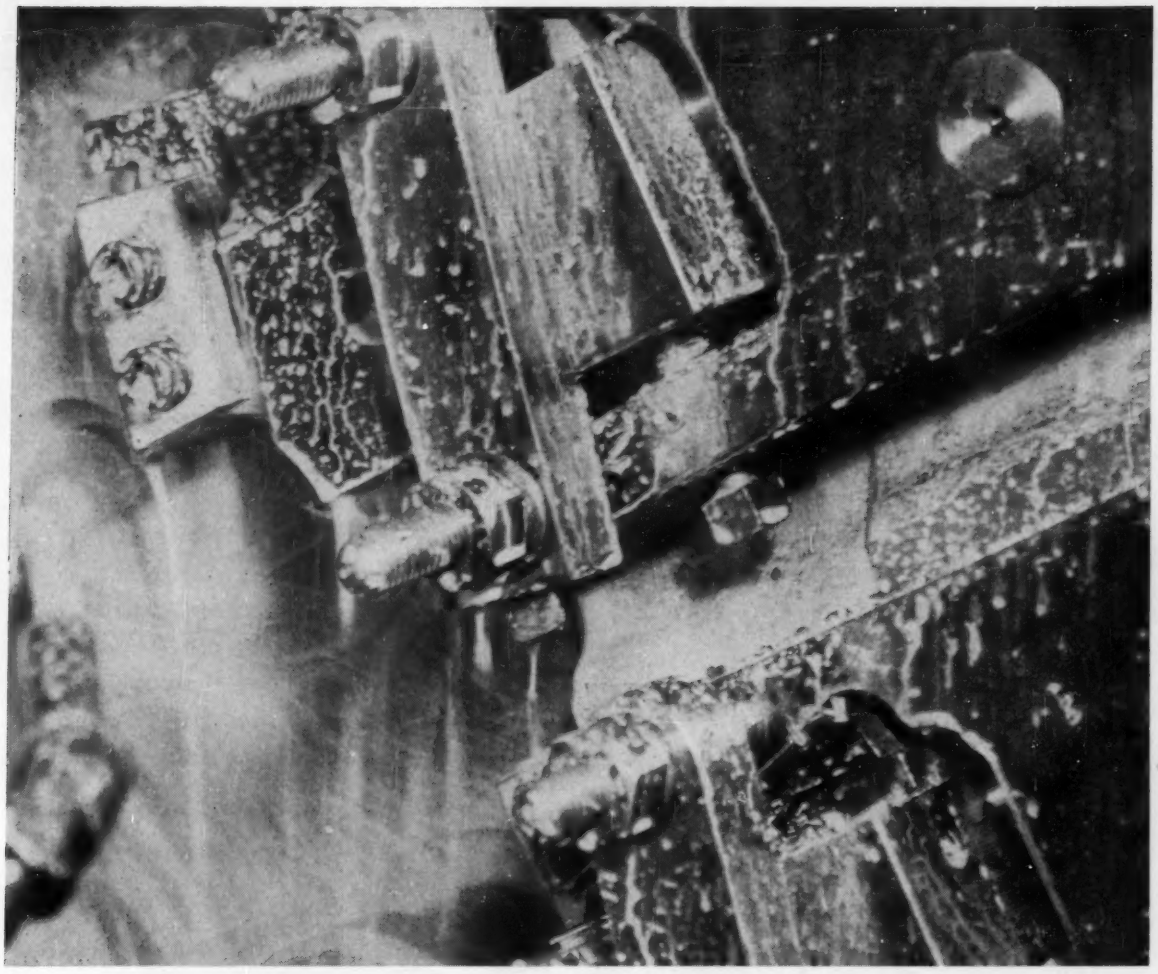
We laughed when the man from Houghton told us about some of the amazing results other shops were getting with ANTISEP All Purpose Cutting Base. We thought if we got even half of what he promised we would be satisfied. So we agreed to a test.

Now we believe him. ANTISEP Base actually made a bigger difference than he predicted. Both speeds and feeds were increased far beyond what we thought was the best our machines could do.

We found that mixed 1:25 with water, ANTISEP Base lets us cut more metal faster than any oil-base product used before. The super-cooling power and extra lubricity are the reasons why. And there's no smoke, no rancidity and no chip build-up.

Finish quality is limited only by the capabilities of tool and machine. The Houghton man offers ANTISEP as just one of a large family of superior cutting oils and bases. He knows their capabilities, and he can help you, too.



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Antisep Soluble Grinding Oil	Antiseptically treated; detergent action; releases grinding dust.
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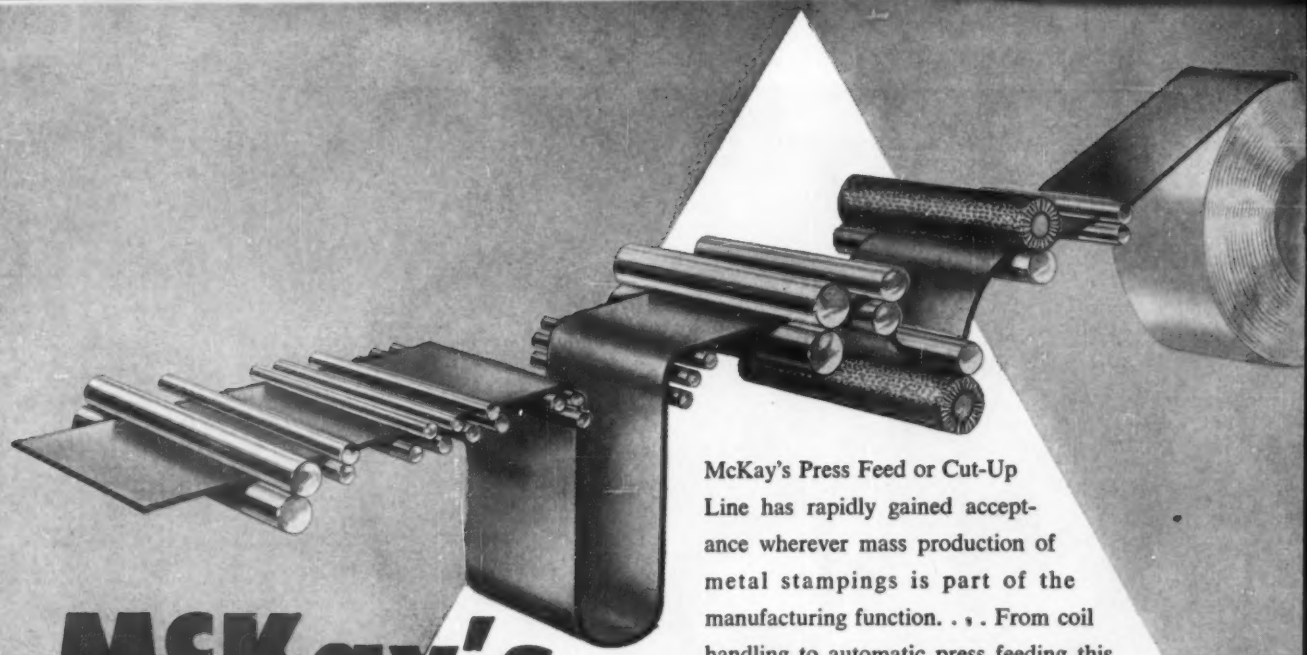

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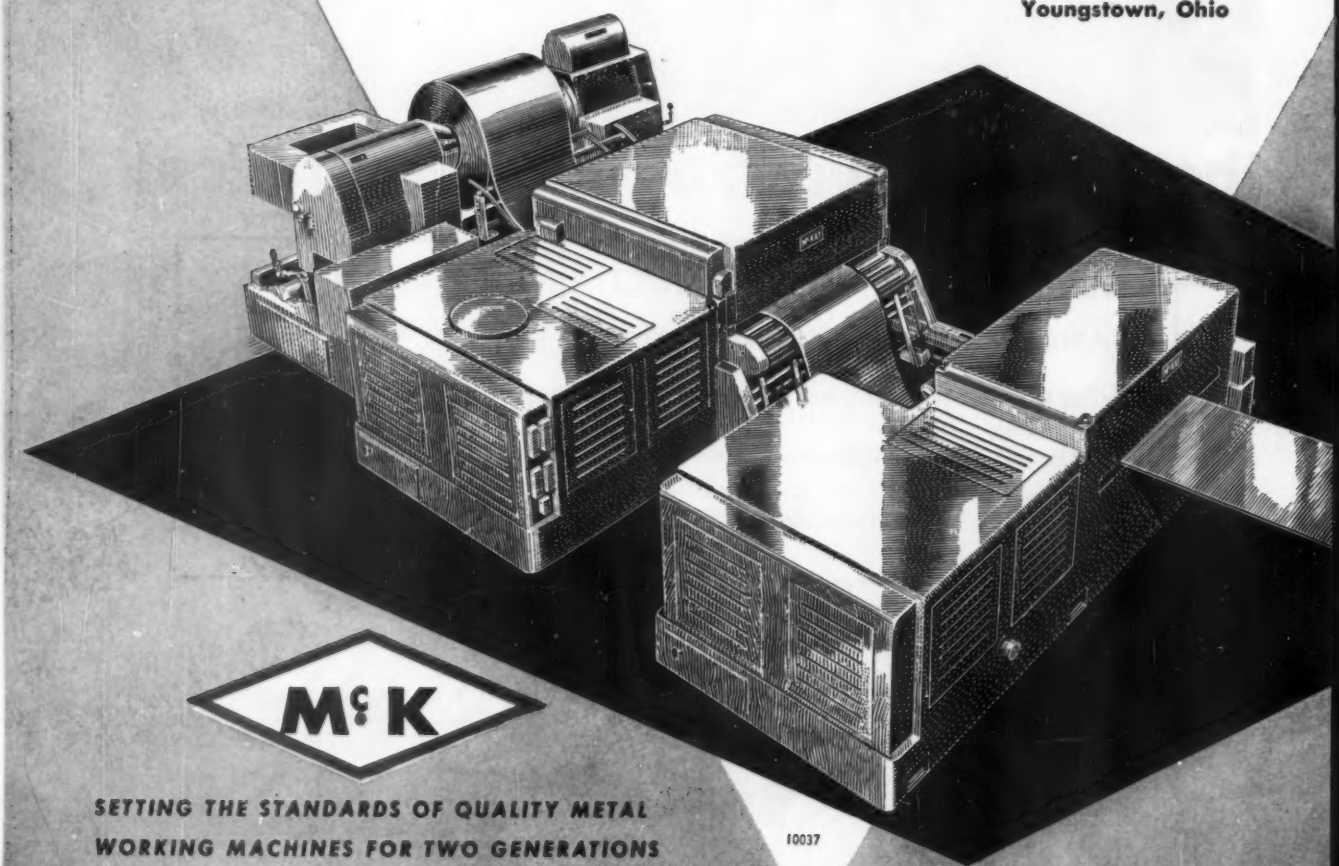

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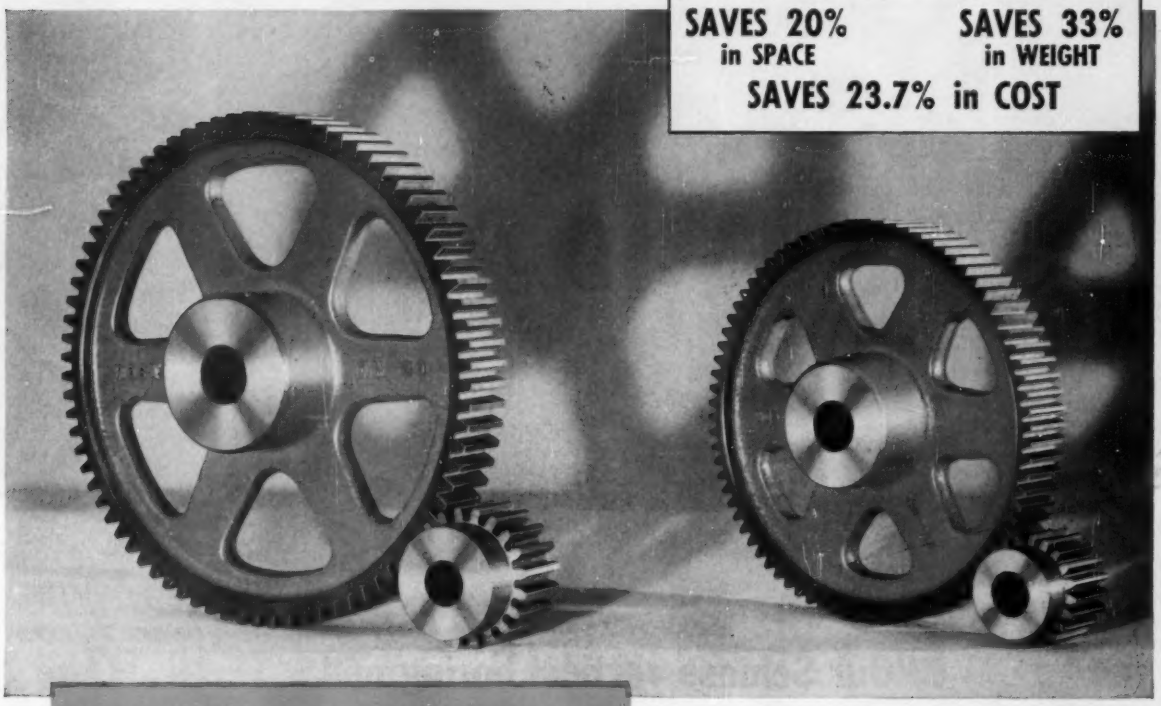

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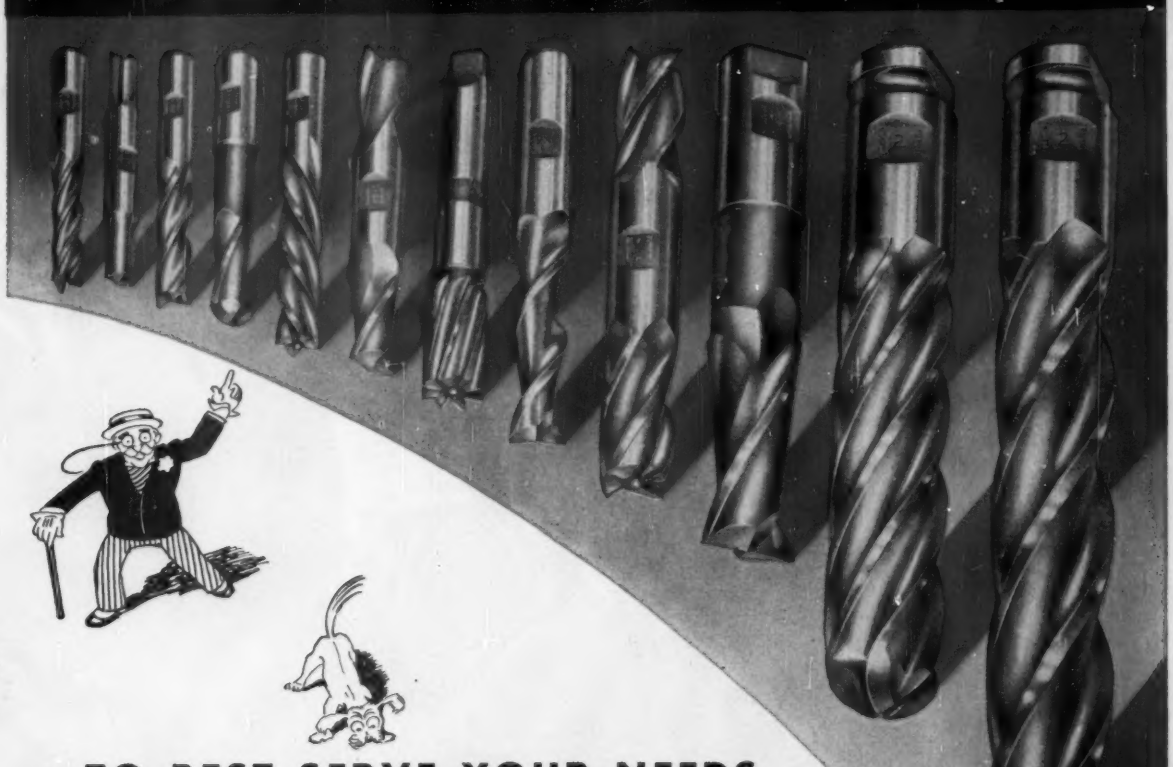

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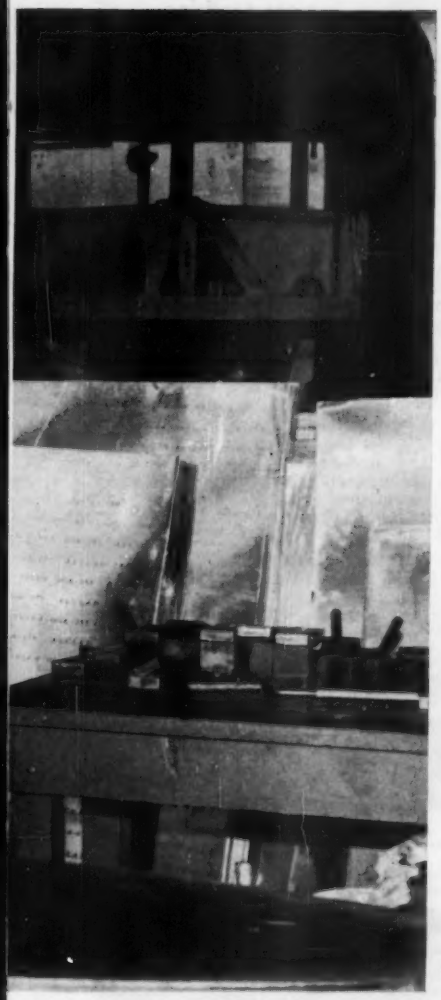

American Machinist's associate editor John Wright and assistant editor Gosta Wernberg, fifth and sixth from left, are seen thru the jaws of a drop hammer press used to form intricate sheet metal parts at Grumman Aircraft Engineering Corp., Bethpage, L. I. With them are, left to right, Bert Knapp, assistant foreman; Vic Olsen, Jack Hockett and Roy Jaret, tool engineers, Manufacturing Engineering section.

The editors' story appeared in American Machinist's March 11, 1957 issue as Special Report No. 440, "Advanced Tooling Speeds Tiger Production." Pressworking ideas extracted from it will be published in the 1958 Production Planbook and Buyers' Guide Issue, coming Mid-September, 1957.

metals, and the advertising pages contain useful product information and distributor lists.

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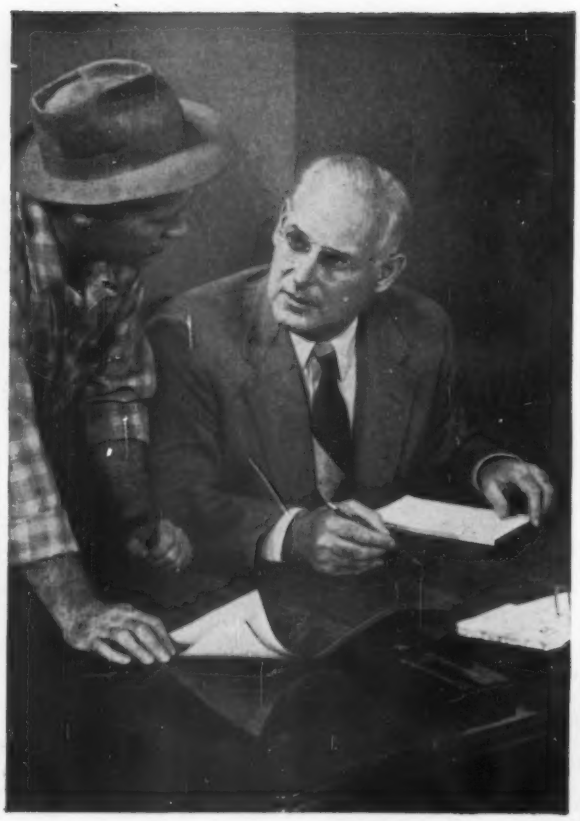
1958 OUTLOOK
MANAGEMENT, PERSONNEL A
MACHINING B
TOOLING C
PRESSWORKING, MOLDING, CASTING D
INSPECTION, TESTING, QUALITY CONTROL E
ASSEMBLY, HEAT-TREAT, FINISHING, (ASSEMBLY INCLUDES WELDING & PORTABLE TOOLS) F
MATERIALS, COMPONENTS G
MATERIALS HANDLING, SERVICES H
PRIZE IDEAS, REBUILT EQUIPMENT I
BUYERS' GUIDE J



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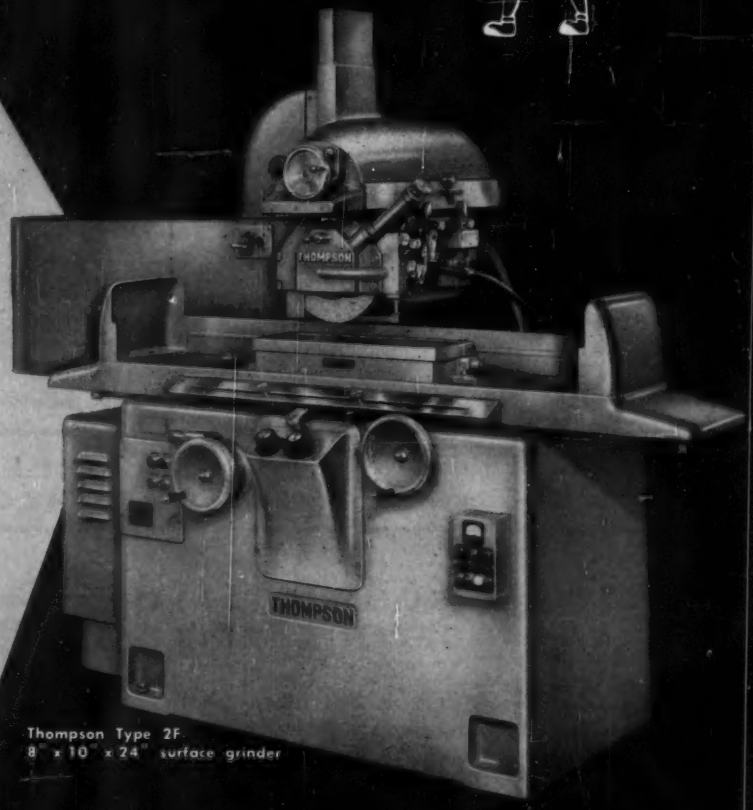

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VK "Quality in Millionths"

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XXX TO ZZ ACCURACY

STEEL, CHROMIUM PLATED or TUNGSTEN CARBIDE

The illustration above shows three Van Keuren wire type plug gages, one of steel, one chromium plated, and one of tungsten carbide. All three are Class XXX, accurate within ten millionths of an inch. This is VK "Quality in Millionths".

You may not require tolerances of this order. Van Keuren wire type gages are available in standard tolerances also, from XX to ZZ, in sizes from .001" to 1.000", in steel, chromium plate or tungsten carbide, whichever material best suits your gaging job. Handles may be either Van Keuren or A.G.D. as preferred.

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VK wire type plug gages are fully described in Catalog and Handbook No. 36, available on request. The next time you need quality plug gages in a hurry, telephone The Van Keuren Co., Watertown, Mass. (WA 4-4394). In many cases we can ship your requirements from stock.

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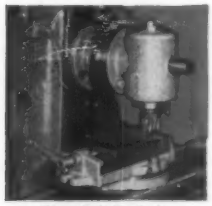
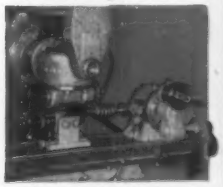


Heavy Duty Vertical Milling Attachment

Heavy Duty Offset Vertical Milling Attachment



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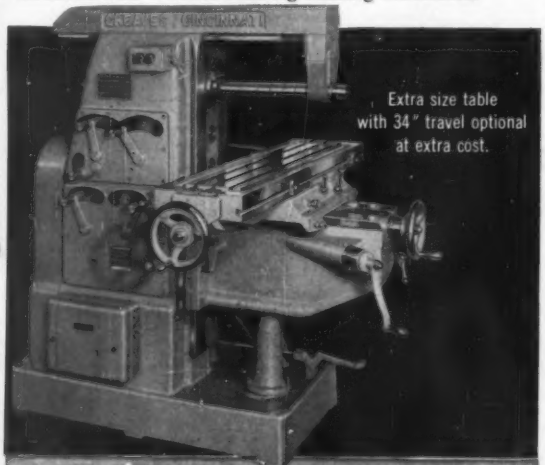

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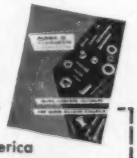

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BATH

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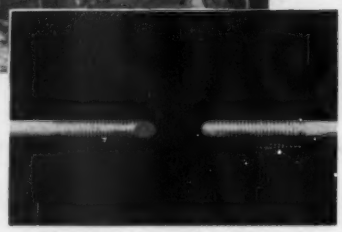
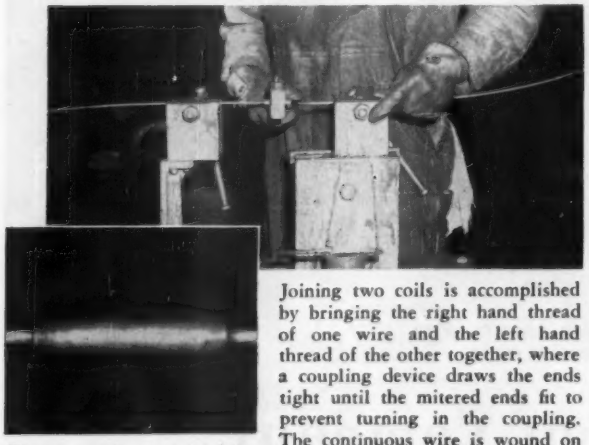
41,200 miles of wire suspends the Mackinac Bridge superstructure — constructed by American Bridge Division, United States Steel.

Each end of the coil of wire is fed to machines where one cuts a right and the other a left hand thread, both ends being mitered.

Photo-courtesy Contractors & Engineers magazine.



Right and left hand thread prior to splicing. Photo — courtesy Mackinac Bridge Authority.



The two ends are joined by a coupling. Photo — courtesy Mackinac Bridge Authority.

Joining two coils is accomplished by bringing the right hand thread of one wire and the left hand thread of the other together, where a coupling device draws the ends tight until the mitered ends fit to prevent turning in the coupling. The continuous wire is wound on huge reels for spinning equipment on the bridge . . . about 70 coils to a full reel of 16 tons (320,000 feet or over 60 miles of wire).

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INTERNAL MICROMETERS

* INTERESTING FACTS

Wires per strand	340
Strands per cable	37
Number of cables	2
Total wires in each cable	12,580
Weight of superstructure	66,500 tons
Length of suspension bridge (including anchorages)	8,614 ft.

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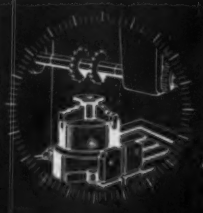
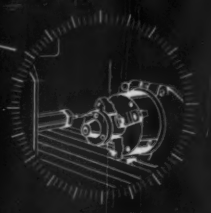
with No. 0 Timken Bearings

gives increased production and optimum accuracy in



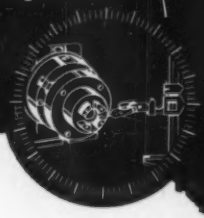
straddle milling



milling

jig drilling
with either micrometer or "Jo" block setting

inspection



Write for free catalog "*Erickson Master Spacer*" today. And at the same time request your copy of Catalog K; you'll find cost-slashing applications for all Erickson holding tools.

The new Erickson Master Spacer quickly and accurately positions work for a wide variety of jobs. This *one* tool can eliminate expensive jigs and fixtures . . . makes it a simple procedure to set up drilling, milling, boring and special machining operations.

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The new Erickson Master Spacer can help you come to grips with your Number One Problem—high production costs. The first step is to get the Erickson story.

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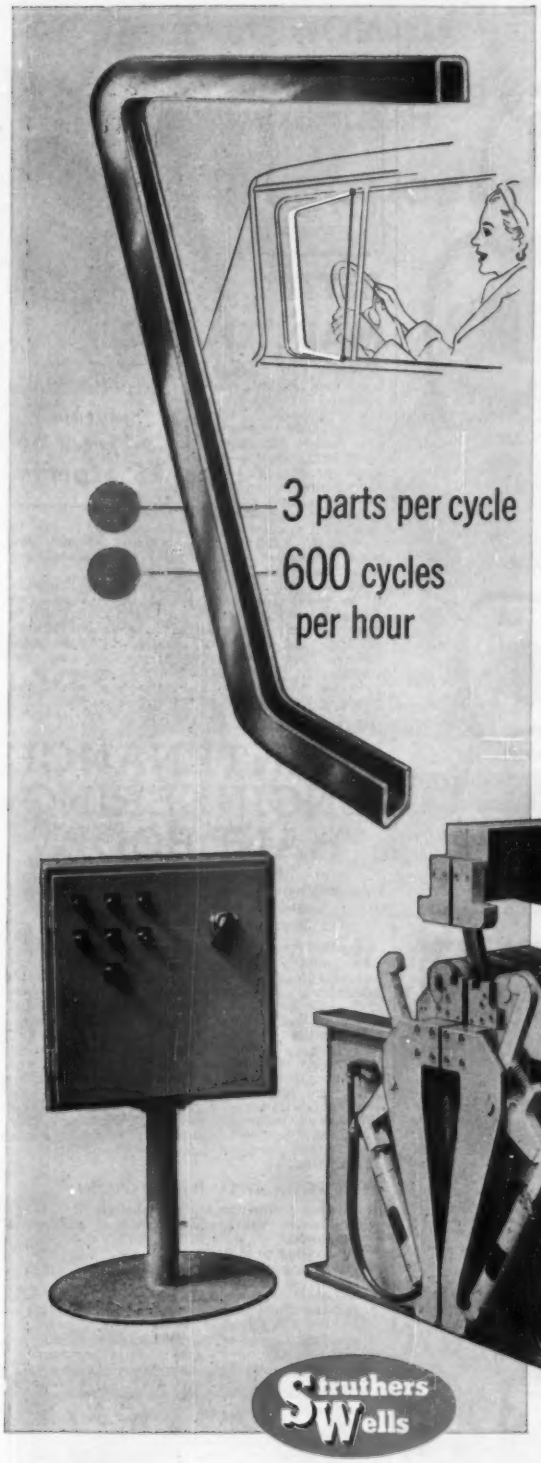

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speed production of automobile
WINDOW VENT FRAMES

Both stainless window vent frames and matching steel weatherstrip retainers are produced in high volume at low cost with Struthers Wells Light Series Tangent Benders. The high-flange preformed channels are shaped in a single smooth operation to relatively sharp bends. Corners are controlled without wrinkling. The polished stainless surfaces are unmarred—ready for installation after forming. ● Write us on your quantity bending requirements.

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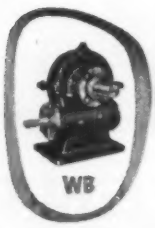

Grant Speed Reducers

YOUR ASSURANCE OF BETTER PERFORMANCE

The *real* criterion for reduction units is unfailing performance over the years, with minimum maintenance. Our files show many cases where Grant Reducers are still providing every-day service, after two decades, without a breakdown.

What's back of such performance? Extra-quality features built into each Reducer, by gear experts . . . totally enclosed cast iron housings, radial thrust ball bearings, precision high-test bronze gears and worms of chrome vanadium steel. These features mean money in your pocket through trouble-free operation.

Grant manufactures a complete range of types and sizes — worm, double worm, compound worm and spur, helical and mitre gear — with reductions up to 3660-1 — most available from stock. Write for the latest catalog, describing each type in detail.

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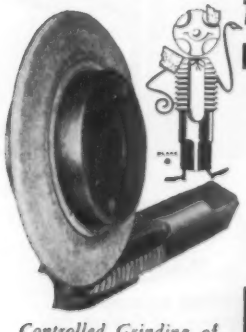

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To Cut Your Tapping Costs, GRIND and RE-GRIND YOUR TAPS ACCURATELY!

Use these basic hook angles as a starting point for better tapping.

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BETTER MAINTENANCE

A voluminous guidebook prepared by **75 experts**

SCORES of experts give you, in this professional handbook, all the workable facts, methods, and techniques you need for better plant maintenance—for lower production costs, higher profits, and improved product quality. From the organization and administration of maintenance forces to sanitation, welding, and corrosion control, you have a detailed picture of *plant maintenance procedures that produce results.*

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THIS BOOK WILL HELP YOU IN:

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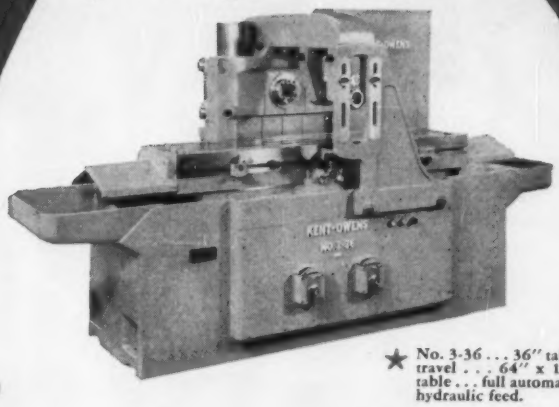

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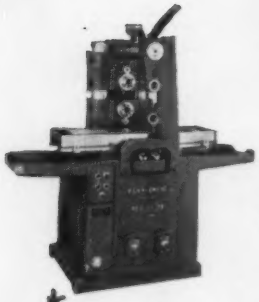

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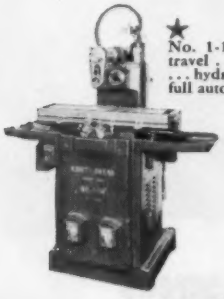

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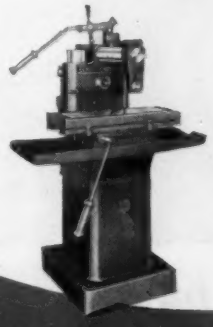

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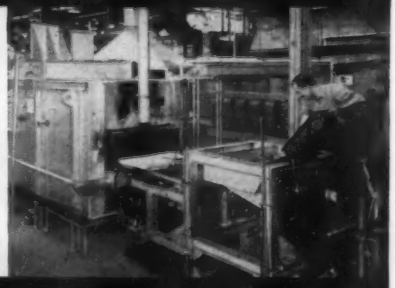
All P-K® Socket Screws are hardened in a propane atmosphere in this Westinghouse furnace to prevent carbon loss, eliminate adsorption of foreign gases. Part of P-K's controlled processing which assures consistent high quality, prevents precipitation or crystallization. Another good reason why . . . *If it's P-K . . . It's O-K!*



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PARKER-KALON® fasteners

How The Answer To Our Own Problem Has Helped Other Manufacturers SAVE MONEY WITH PRODUCTION LAPPING

One section of our production lapping department showing a battery of Model 48" Lapmasters® turning out a part of the high volume required every day in the precision lapping of all John Crane Mechanical Seals.

A few years ago, we had to find a faster and *better* way to produce flatness and finish on mating parts in order to keep up with the constantly growing demand for John Crane® Mechanical Seals.

Lapping was the only way of meeting our rigid quality specifications... but available lapping equipment could not *consistently* turn out acceptable work at the production rates demanded. With necessity, the mother of invention, we developed the Lapmaster® and solved a serious problem.

HERE'S WHY hundreds of manufacturers have since discovered the time and money saving advantages of production lapping with the Lapmaster:

- The Lapmaster eliminates production bottlenecks frequently caused by old lapping methods.
- You can depend upon flatness within tolerances of .0000116" or less with absolute uniformity, piece after piece.
- No downtime for truing lap plate... conditioning rings automatically keep plate flat and true.
- Product performance and quality improved... rejects cut to minimum... inspection costs reduced.
- Operator need not be experienced in the art of lapping.
- Frequently eliminates other machining operations.
- Handles large or small parts... any shape or form ...any metal, ceramics or plastic materials.

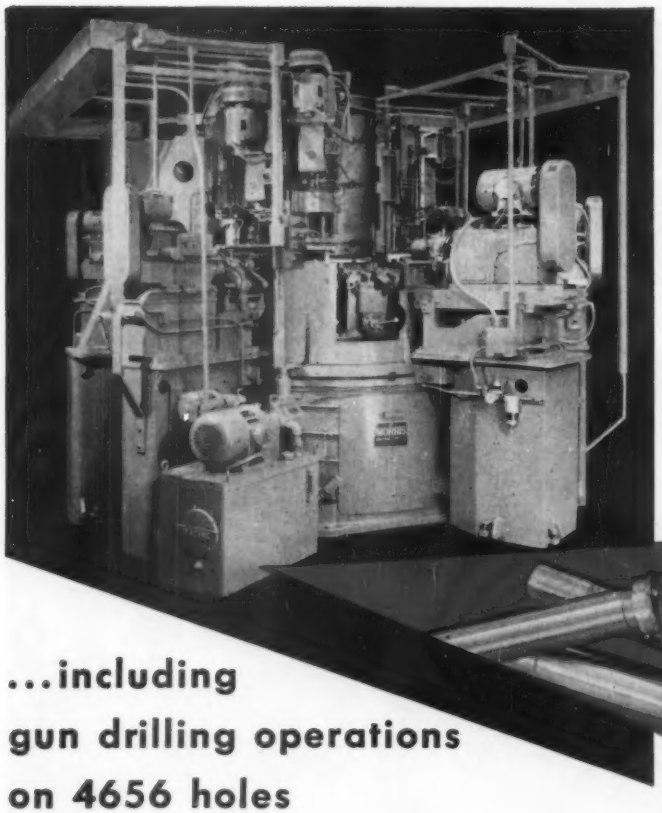
HOW TO PROVE TO YOURSELF

That the Lapmaster Can Save You Money, Too

Send us samples and surface flatness and finish specifications of parts... we'll test run them in our experimental lapping laboratory and furnish you with a complete production report without obligation. Or write for FREE Booklets with complete facts on producing and measuring precision flatness and finish.

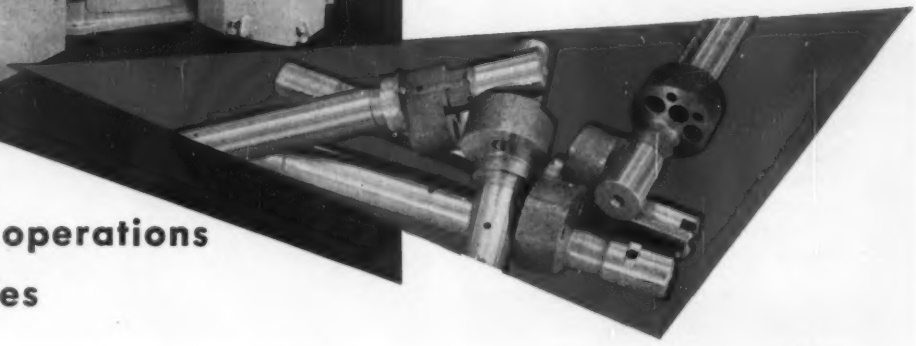
Crane Packing Company, 6436 Oakton St., Morton Grove, Ill. (Chicago Suburb)
In Canada: Crane Packing Co., Ltd., Hamilton, Ont.

CRANE PACKING COMPANY



EVERY 8 HOURS THIS PRECISION MACHINE

- DRILLS 8536 HOLES
- MILLS 776 FLATS
- MILLS 776 SLOTS



...including gun drilling operations on 4656 holes

...all automatically!

This MORRIS Model 322-S High Production Machine produces 97 refrigeration compressor crankshafts per hour at 80% efficiency. In each part it automatically drills 11 holes, varying in diameter from .125″ to .375″. Six holes, including one hole 4¾″ deep, are drilled using gun drilling techniques. In addition, the machine mills one end slot and one chordal flat on the shaft.

These operations are coordinated through use of a MORRIS basic center column machine, equipped with a 48″ dia. table, a 12-station automatic indexing mechanism, and 16 MORRIS AIR-OIL-Matic and Cam-Matic Drill Units.

The result is a completely automatic "special" machine, designed using a standard basic machine and standard drill units . . . at a fraction of the usual special machine cost. The machine may be altered for model changes, without scrapping a complete machine.

Investigate the production-boosting and cost-saving advantages of MORRIS Unit-Type High Production Machine Tools. WRITE TODAY for detailed literature, or outline your production problem for analysis by MORRIS engineers.

See our insert in Sweet's Machine Tool File

Builders of MOR-SPEED Line

Morris

MACHINE TOOL COMPANY
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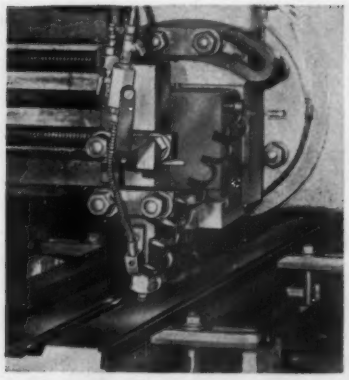


ANOTHER MIST-COOLING SUCCESS STORY

Fischer Machine Company, Philadelphia, Pennsylvania, solved their difficult planer job in cutting SAE 1035 channels by teaming Kennametal Tungsten Carbide Tools with a MILFORD Atom-Lube for Mist Cooling. Cutting at 300 S.F.P.M. with a feed of .050 inches, excellent tool life was obtained with the elimination of heat checking and tool breakage.

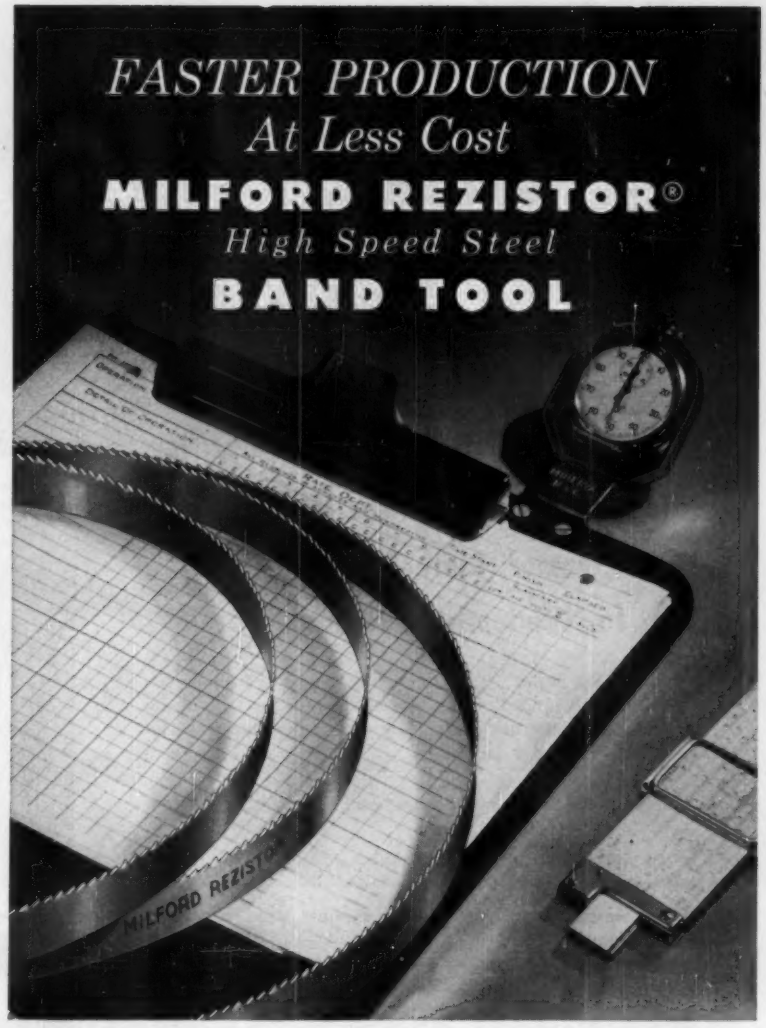
MILFORD Atom-Lubes are ruggedly designed for mist cooling tough industrial applications such as this Fischer Machine Company job. With an established record of success in sawing, grinding and milling, the MILFORD Atom-Lube offers new performance horizons for many other metal cutting tools. Adaptable to any piece of equipment, the MILFORD Atom-Lube is a natural where heat is a factor in any metal cutting operation.

FASTER CUTTING OF MODERN, HARD-TO-MACHINE METALS

Band Saws made of high speed steel proved the answer to Lukens Steel Company's* unusual sample cutting problem at its mill in Coatesville, Pennsylvania. Rolling heavy armor plate, up to two inches thick, requires constant metallurgical sampling to insure quality control. However, due to the great toughness of the plates, fast economical cutting of samples was difficult and production delays resulted. Lukens Steel Company now uses MILFORD REZISTOR High Speed Steel Band Tools.

The Henry G. Thompson & Son Company, makers of MILFORD Hack and Band Saw Blades and other products, recognizes that today's tough, hard-to-machine alloys and stainless steels demand new and improved cutting tools. A pioneer in metal cutting, MILFORD has been responsible for many important advances and industry firsts in the field. Once again, MILFORD has led the way with the development of the first band saws made of "red hardness" high speed steel. These blades are MILFORD's answer to industry's requirement for more accurate, faster cutting, high production cut-off band tools.

**Distributor serving Lukens Steel Company — Diamond Specialty & Supply Company*



NOW AVAILABLE FOR IMMEDIATE DELIVERY... the REZISTOR Band Tool is specially designed for your heavy-duty band saw machines. This *red-hardness high speed steel* blade cuts many times faster... lasts far longer than any carbon steel band. It cuts consistently smoother and straighter than other cut-off methods . . . and chip loss of expensive metal is greatly reduced.

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BUY FROM YOUR MILFORD DISTRIBUTOR . . . a local businessman who stocks the tools and equipment you need. You'll SAVE TIME, CUT BUYING COSTS and REDUCE INVENTORIES.

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HACK SAW AND BAND SAW BLADES • HOLE SAWS • GROUND FLAT STOCK

SERVICE TESTED

PEER

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PERFORMANCE PROVED

Reo Motors Reports Peer Welders Better, Faster, More Adaptable, Best for Production Welding

Fifteen P-20 Series Peer spot welders are in use in the Lansing, Mich. plant of Reo Motors, Inc., making a variety of welds on Reo truck parts. Here's what the men who depend on them have to say:

"Reliable operation of Peer welders means better, faster welds."

"Peer welders are more adaptable, designed for different set-ups."

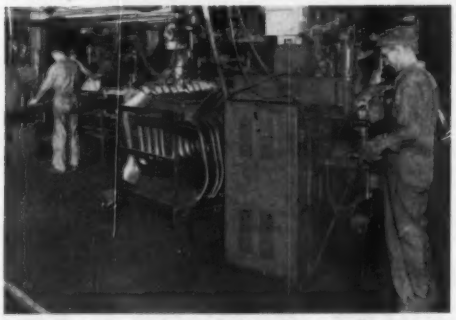
"Peer welders stand up well in service, need very little maintenance."

"*I would recommend Peer welders* to others," says Garth Barrett, supervisor, Reo Depts. 28, 42A and 20. Vance Disbro, foreman, Dept. 15, comments: "I trust a Peer weld over *any* C type gun weld."

In plants across the country, Peer welders are on the job, helping to do things better, faster, more economically. For aid in solving your resistance welding problems contact your nearest Peer or Rex Distributor or write direct.

PEER REX

Reo Motor Spot Welder Edward Ballance welds two small clips and two defroster tubes, left and right, on truck instrument panel, using Peer welder P20 (KVA 20) with Square D Controls.



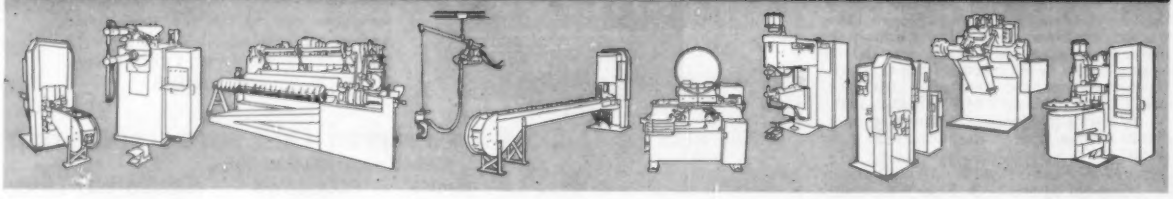
Workers in Reo Motors Lansing plant use Peer equipment to weld steel ventilator doors, dash assemblies and lower dash panels.

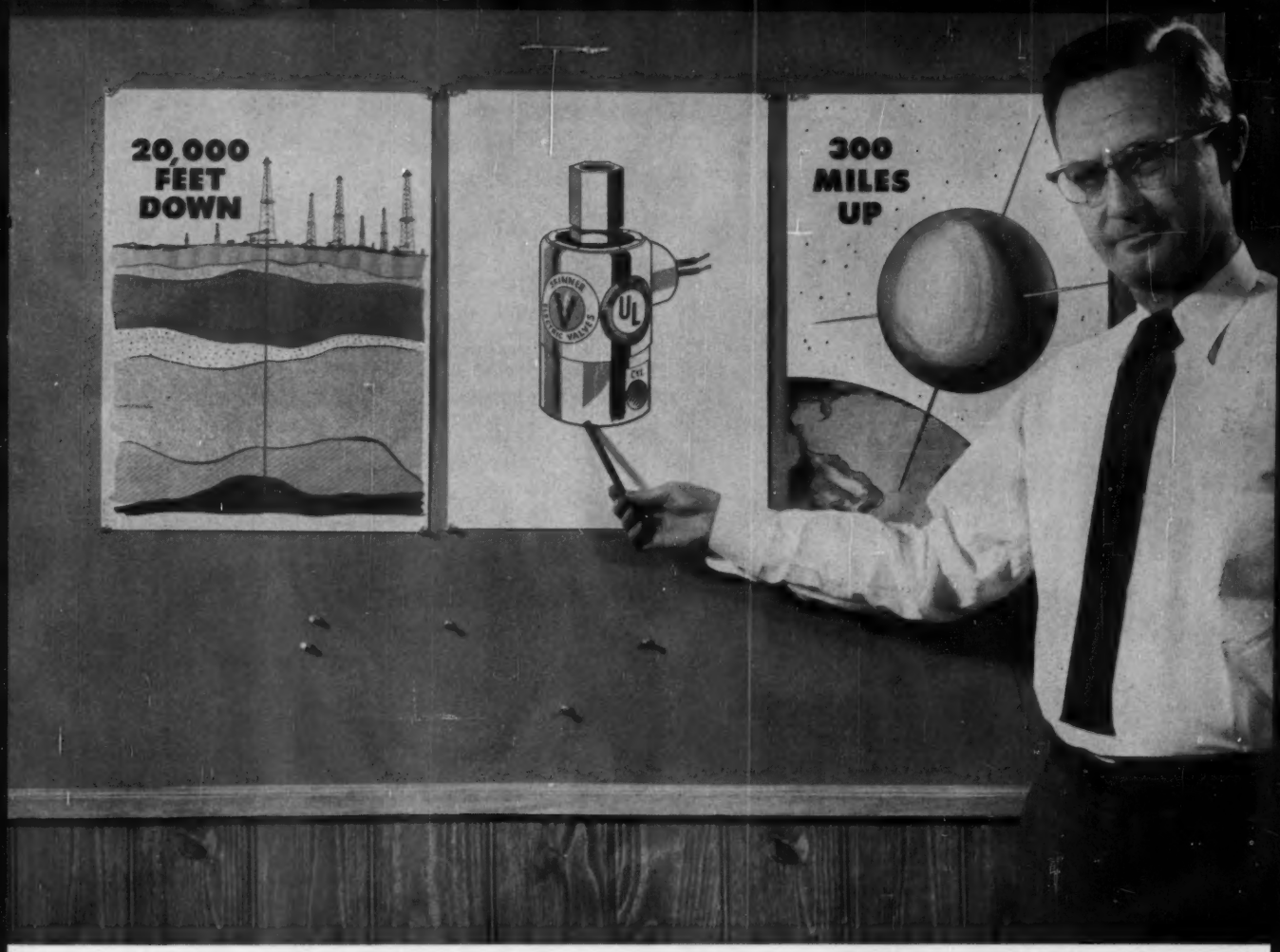
Peer P20 Series welders in use at Reo Motors plant welding truck cab, fender and hoop braces of 16 gage deep draw steel.

RWMA

Peer, Incorporated • WELDING EQUIPMENT DIVISION • BENTON HARBOR, MICHIGAN

TWO COMPLETE LINES: STANDARD RESISTANCE WELDERS; SPECIAL AUTOMATIC HIGH-PRODUCTION WELDING EQUIPMENT





The versatile design of Skinner Solenoid Valves makes their applications almost unlimited

Skinner Solenoid Valves have such great versatility that no one, not even their makers, knows the full extent of their applications. The range of their extremes demonstrates this vividly. One Skinner valve is being used in an instrument in Texas oil wells that tells the nature of earth strata 20,000 feet below the surface. Another one will be used to help launch the satellite that soon will be circling the globe.

If you have a problem that a solenoid valve might conceivably solve, we urge you to talk to a Skinner representative. Fill him in on the nature of your application. He'll be glad to work with you in selecting a valve that matches your requirements as to port sizes and locations, voltages, pressures, temperature conditions, flow adjustments and mountings.

For complete information on Skinner's line of 2-, 3- and 4-way valves, write us or contact a Skinner representative. Write Dept. 304.

Skinner Solenoid Valves are distributed nationally

SKINNER ELECTRIC VALVES

THE CREST OF QUALITY

SKINNER ELECTRIC VALVE DIVISION

NEW BRITAIN
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105 EDGEWOOD AVENUE

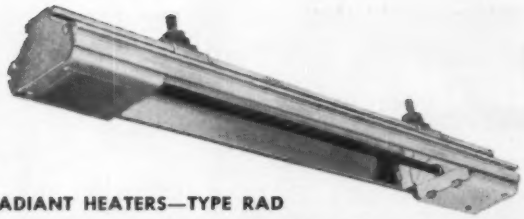
Fast, uniform heat dialed to your exact need with CHROMALOX® Electric Far-Infrared

Here are four quickly available, easily installed ways to end production delays, irregular product quality and other common problems caused by inadequate heat sources. With Chromalox Electric Far-Infrared, you get uniformly distributed heat at the right temperature for the work. No more stand-by losses, leaking lines, smoke, fumes or flames. It's cooler and cleaner for your workers, too.

Chromalox Electric Far-Infrared radiation is absorbed uniformly by practically all colors, even by transparent materials. Elements are self-cleaning and maintenance costs are a bare minimum. All-metal heaters are practically indestructible. With no need for stand-by heat and since heat is generated where used, all energy is utilized.

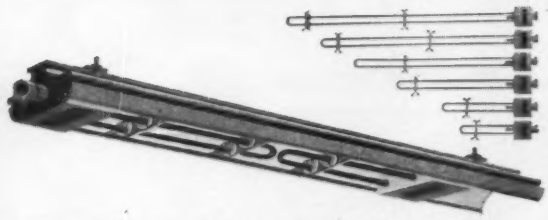
To get more information, call your Chromalox Representative or write us direct for the Bulletins listed. In addition, if you will tell us your problem, we will send you a case history of an identical or similar application.

With Chromalox Electric Far-Infrared, you benefit in all these operations:
Annealing • Calendering • Curing Degreasing • Dehydrating • Drying Embossing • Food processing • Forming Fusing • Heat sealing • Laminating Molding • Paint baking • Planishing Polishing • Resin finishing • Setting coatings • Shrink fitting • Weld preheating.



RADIANT HEATERS—TYPE RAD

For single assembly or in banks. Two bolts in sliding clamps facilitate mounting; two wires to connect. Six standard lengths, 14 standard wattages. Housing is rigid extruded aluminum with brightly polished parabolic non-oxidizing reflector. Write for Bulletin CS-604.

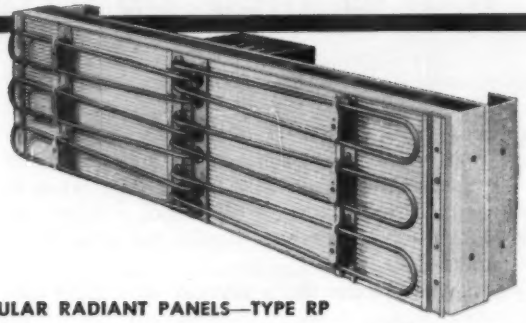


ADJUSTABLE AREA RADIANT HEATERS—TYPE U-RAD

Lets you match heat area to work area. Choose one basic housing to match your largest work. Into this housing install any of 6 different heaters to get up to 27 heated lengths as job sizes change. Bulletin CS-607

METARAY® LAMP REPLACERS—TYPE FRB

Now any infra-red reflector bank can be equipped with glassless, glareless, self-cleaning Metaray elements. Radiation is spread more uniformly from the larger element configuration. Write for Bulletin L-1104.



MODULAR RADIANT PANELS—TYPE RP

A high-intensity heat source in four standard sizes. Modular panels completely factory assembled with built-in continuous bus, reflector, insulation, frame and mounting. Lets you tailor heat source exactly to process requirements. Write for Bulletin CS-606.

THE RIGHT HEAT, EASILY DUPLICATED AT THE TURN OF A DIAL

Inexpensive, automatic input controllers provide accurate temperatures. As required by different work, heater input can be set anywhere from 4 to 100% of capacity. Better control, combined with better distribution, give more uniform product quality and higher production.

CHROMALOX — FIRST MADE IN ELECTRIC HEAT

Edwin L. Wiegand Company

7577 Thomas Boulevard • Pittsburgh 8, Pa.

C-2181

300 ton Pacific Hydraulic Brake is accurate within thousandths of an inch. Angles from top down are 90°, 116°, 100°, 120°, 166°.

Presetting controls for the different angles to be formed consecutively.

forms 7 different angles in succession without resetting controls

PACIFIC HYDRAULIC PRESS BRAKE

In a single handling of metal, Pacific Hydraulic Press Brake forms an entire series of different bends. You set the controls just once and run through the entire sheet or plate. Handling time is cut to a minimum. Operating on the "air bending" principle, the ram comes down to a different depth with each stroke forming the various angles preset on the controls. Each bend is accurate within thousandths of an inch. The length of stroke can be adjusted to match any job; bends up to 12" deep can be formed in a single stroke while the stroke can be reduced to less than 1/8" and the press will cycle 50 strokes per minute or more.

The ram is held level automatically by patented controls so that work can be done at any point along the entire length of bed. Thus a piece can be passed progressively from die to die for blanking, deep drawing, embossing, punching and forming. In punching, continuous power drives the punch through heavy plate with the shock being absorbed by the hydraulic cushioning of the cylinders. This Pacific Hydraulic Brake is also used for straightening, rubber pad forming, pipe making, stretching, extruding, hot forming and even shearing heavy plates. The Pacific cannot be jammed or overloaded and its precise accuracy is maintained indefinitely. Maintenance is low.

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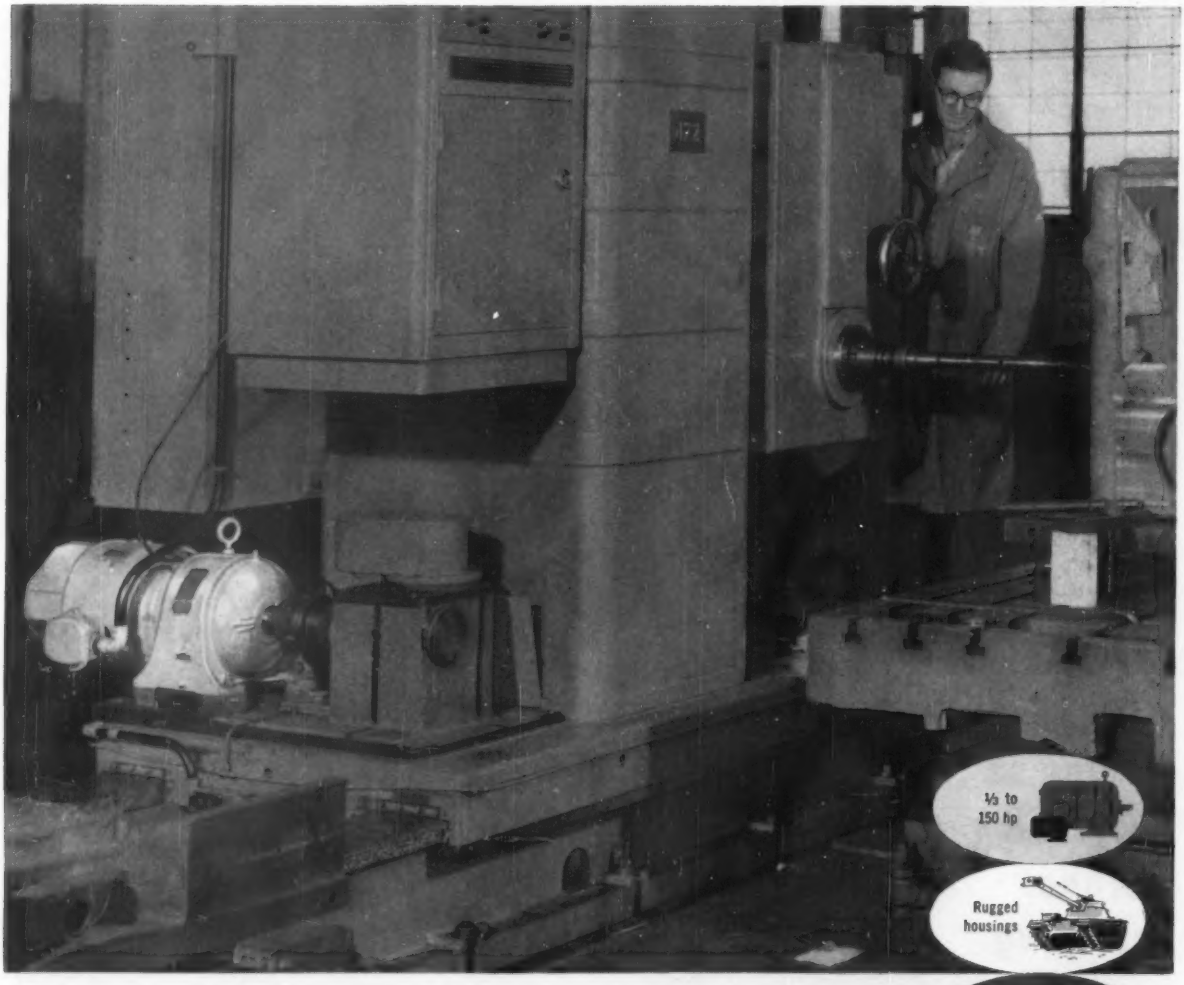

Duti-Rated gear drives for smooth, fine-line positioning

Louis Allis provides compact, sturdy gearmotors for dependable machine-tool drives

Wherever your machine-tool drive problem calls for reduced or low-speed operation, a Foote Bros. — Louis Allis gearmotor can provide a dependable low-cost solution. The 3 hp, 248 rpm, 9.3:1 D. C. gearmotor shown above is a typical installation.

These gearmotors have been field-proven on many machine-tool applications . . . drilling and tapping machines, grinders, vertical mills, planers, and punch presses . . . where precision is required.

They are compactly designed to give you maximum power in a minimum space. The sturdy cast-iron stress-free housing eliminates distortion and deflection of the rotating elements, and assures you of permanent drive alignment. File hard gears with ductile cores are Duti-Rated to withstand and absorb punishing rapid reversal cycles.

Foote Bros. — Louis Allis helical gearmotors are available from 1 to 150 hp, output speeds from 780 to 7½ rpm. Louis Allis right-angle gearmotors are rated ⅓ to 30 hp, with reduction ratios up to 100:1.

There's expert field application service, too. Contact your Louis Allis District Office or write to the Louis Allis Co., 452 East Stewart St., Milwaukee 1, Wis.

LOUIS ALLIS

MANUFACTURER OF ELECTRIC MOTORS AND ADJUSTABLE SPEED DRIVES

A NEW FERRACUTE PRESS

TO SIZE OR "RESTRIKE" POWDERED METAL PARTS

400-ton SPECIAL
DOUBLE TOGGLE COINING PRESS
with 100-ton pressure on lower knockout

Stroke: Upper toggle—9"
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Variable Speed Drive: 15 to 30 S.P.M.
Feeding Mechanism: Cam-operated dial

Your inquiries invited on the efficient press production of powdered metal components. Press sizes and tonnage capacities available to meet your requirements

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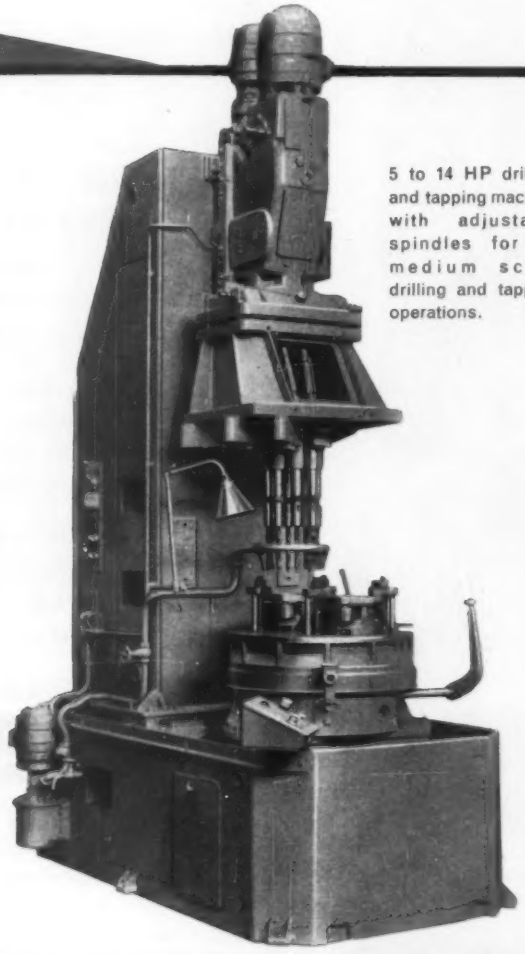
designed and built to solve your machining problems for medium and large-scale series production.



5 to 14 HP drilling and tapping machine with adjustable spindles for all medium scale drilling and tapping operations.

with RENAULT ELECTRO-MECHANICAL UNIT HEADS

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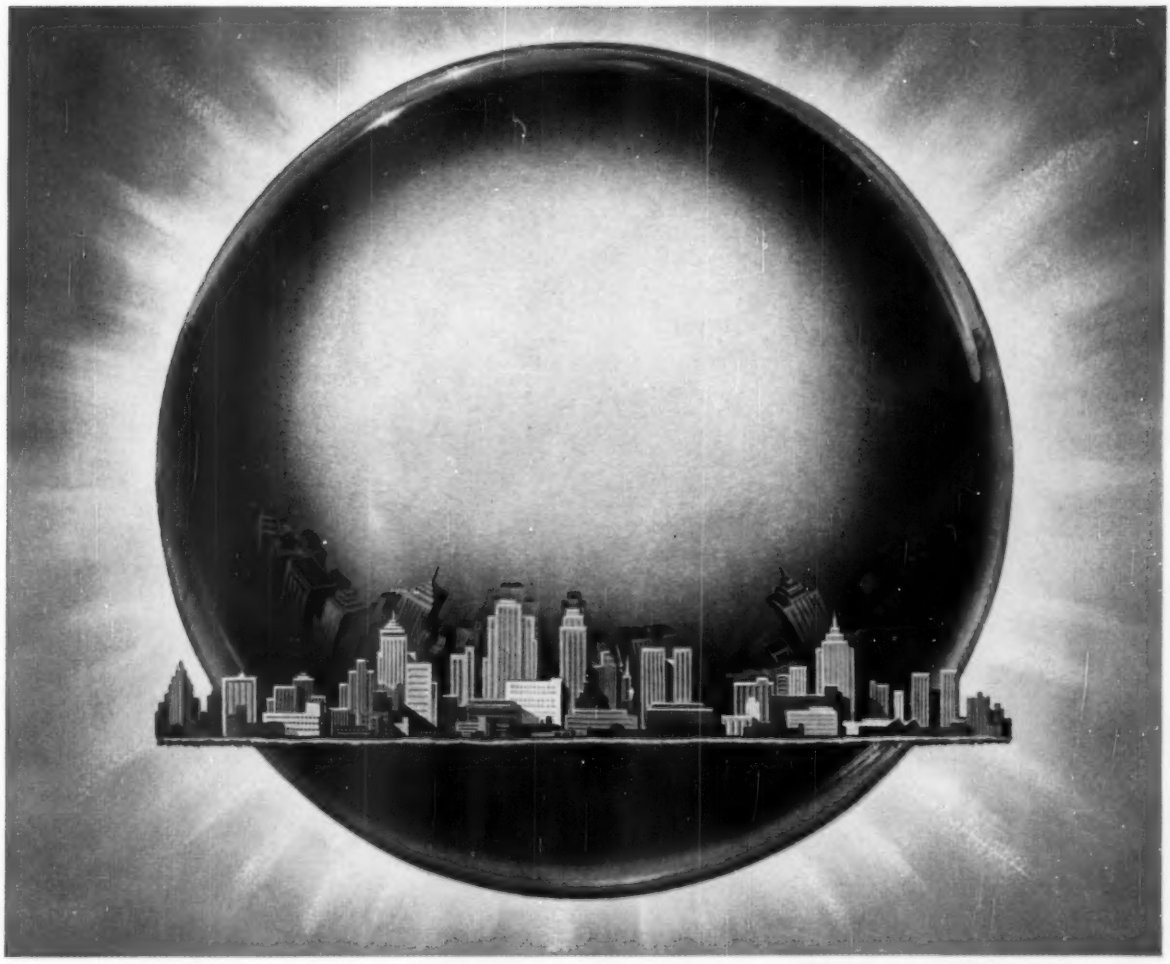

Imagine a mile-wide ball with surface finish accurate to within 1/16"

If Hoover could make this giant bearing ball—one mile in diameter—and maintain Hoover quality of precision manufacture, the immense sphere would be so smooth that surface finish would be accurate to within 1/16 inch!

In actual terms, the surface smoothness of a Hoover Ball is measured on a micro-inch basis. Roundness and diameter are held within 25 millionths of an inch. Microscopic precision, both in smoothness and spherical accuracy, means quality in Hoover *Micro-Velvet* Lapped Balls.

Equipment which will measure surface quality to a fraction of one millionth of an inch is used to check and re-check Hoover Balls. A perfectly matched set of *Micro-Velvet* Balls goes in each bearing.

These precision-made balls team up with the ultra-smoothness and minutely exact curvature perfection of famous *Hoover Honed* Raceways.

The result . . . equalized load, high capacity, and quiet operation, assuring superior operating performance and long life.

Investigate Hoover's complete line of balls, made in many metals, as well as light, medium and heavy series ball bearings. Engineering assistance is readily available to manufacturers. Write for information.

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BALL AND BEARING COMPANY, ANN ARBOR, MICHIGAN

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HOOVER HINTS:

Factors Involved In Bearing Selection

Application is the key to bearing selection. The importance of a bearing's characteristics is relative to the job it must do. Usually one of the most important factors is the capacity or load-carrying ability. Also important in many applications is the type of loading—thrust, radial or combined . . . the amount of friction involved . . . the ease of assembling a bearing into a unit . . . the danger of misalignment . . . the limiting maximum speed.

All types of anti-friction bearings are concisely compared and analyzed from an engineer's standpoint in "Engineer's Handi-Book of Anti-Friction Bearings." Send for yours now.

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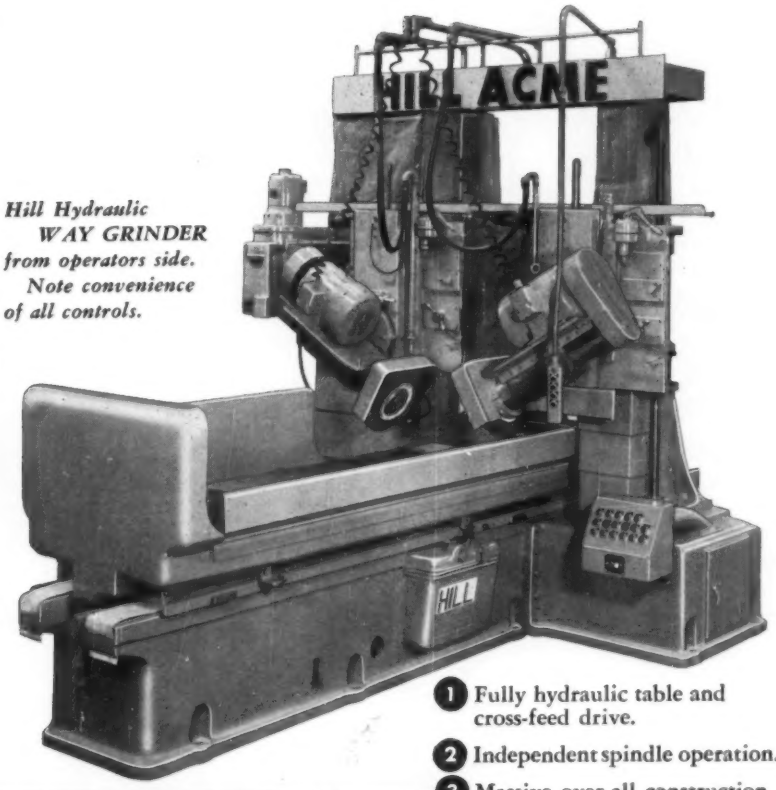
9

HILL double housing WAY GRINDER for accurate grinding of V's, Flats and Angles

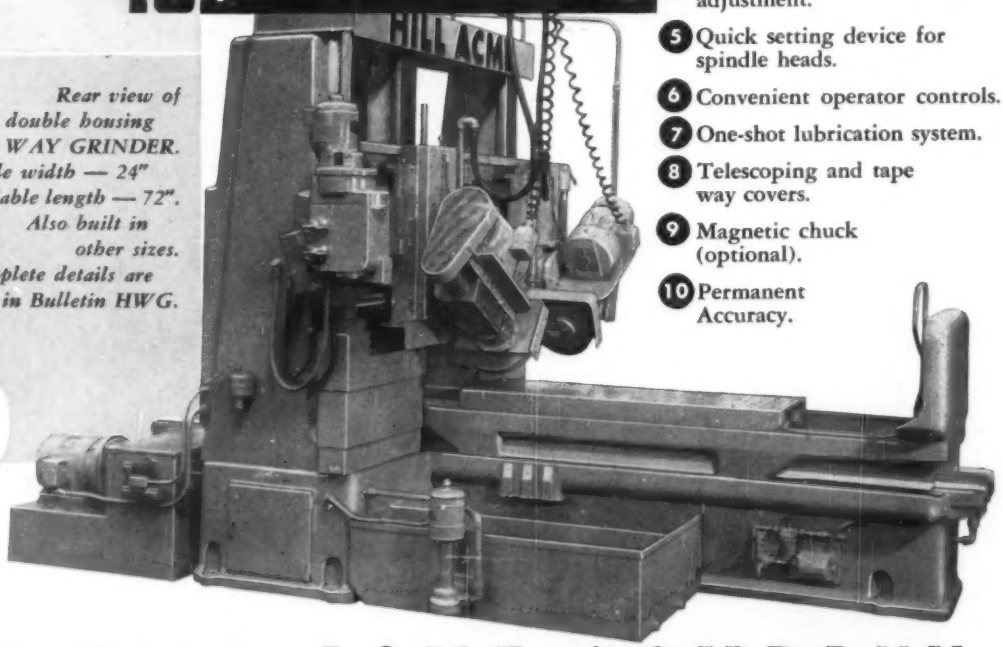
Substantial Savings (up to 50%) over previous methods.



Hill Hydraulic WAY GRINDER from operators side. Note convenience of all controls.

10 points worth considering

1. Fully hydraulic table and cross-feed drive.
2. Independent spindle operation.
3. Massive over-all construction.
4. Rapid traverse and fine feed adjustment.
5. Quick setting device for spindle heads.
6. Convenient operator controls.
7. One-shot lubrication system.
8. Telescoping and tape way covers.
9. Magnetic chuck (optional).
10. Permanent Accuracy.



Rear view of HILL double housing WAY GRINDER. Table width — 24" Table length — 72". Also built in other sizes. Complete details are given in Bulletin HWG.

HILL ACME TOOLS FOR INDUSTRY

THE HILL ACME COMPANY

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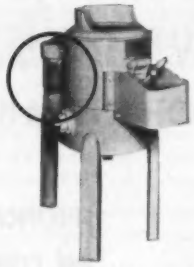
"HILL" GRINDING & POLISHING MACHINES • HYDRAULIC SURFACE GRINDERS • ALSO MANUFACTURERS OF "ACME" FORGING THREADING • TAPPING MACHINES • "CANTON" ALLIGATOR SHEARS • BILLET SHEARS • "CLEVELAND" KNIVES • SHEAR BLADES

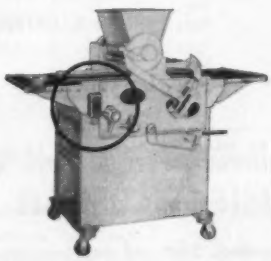
Townsend impact riveter protected by an Allen-Bradley Bulletin 600 starter.



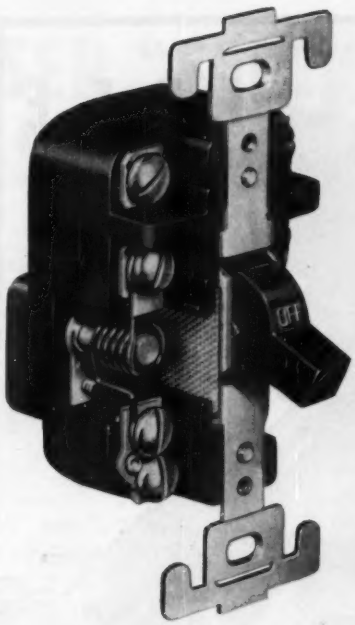
Gifford-Wood vegetable peeler with an Allen-Bradley Bulletin 600 starter.

Unit space heater protected by an Allen-Bradley Bulletin 600 starter.

Kleen-Kut meat mixer has a ¾ hp motor and an A-B Bulletin 600 starter.



Triumph cookie dropper is protected by an Allen-Bradley Bulletin 600 starter.



LOW COST QUALITY MANUAL STARTERS
....for motors of 1 hp or less

Many small machine tools, restaurant equipment, fans and blowers, space heaters, etc., are operated by fractional horsepower motors. But even though the motors are small and relatively inexpensive, a motor burnout may disrupt important production schedules and, therefore, prove to be a costly accident.

Play safe—equip all of your small motor drives with Allen-Bradley Bulletin 600 starters. They have a built-in solder pot thermal overload breaker which remains accurate and dependable. It is low cost safety and production insurance.

Write for Bulletin 600, please.

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Milwaukee 4, Wis.

In Canada—
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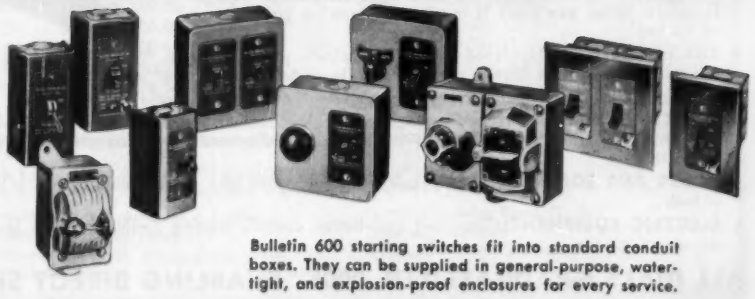
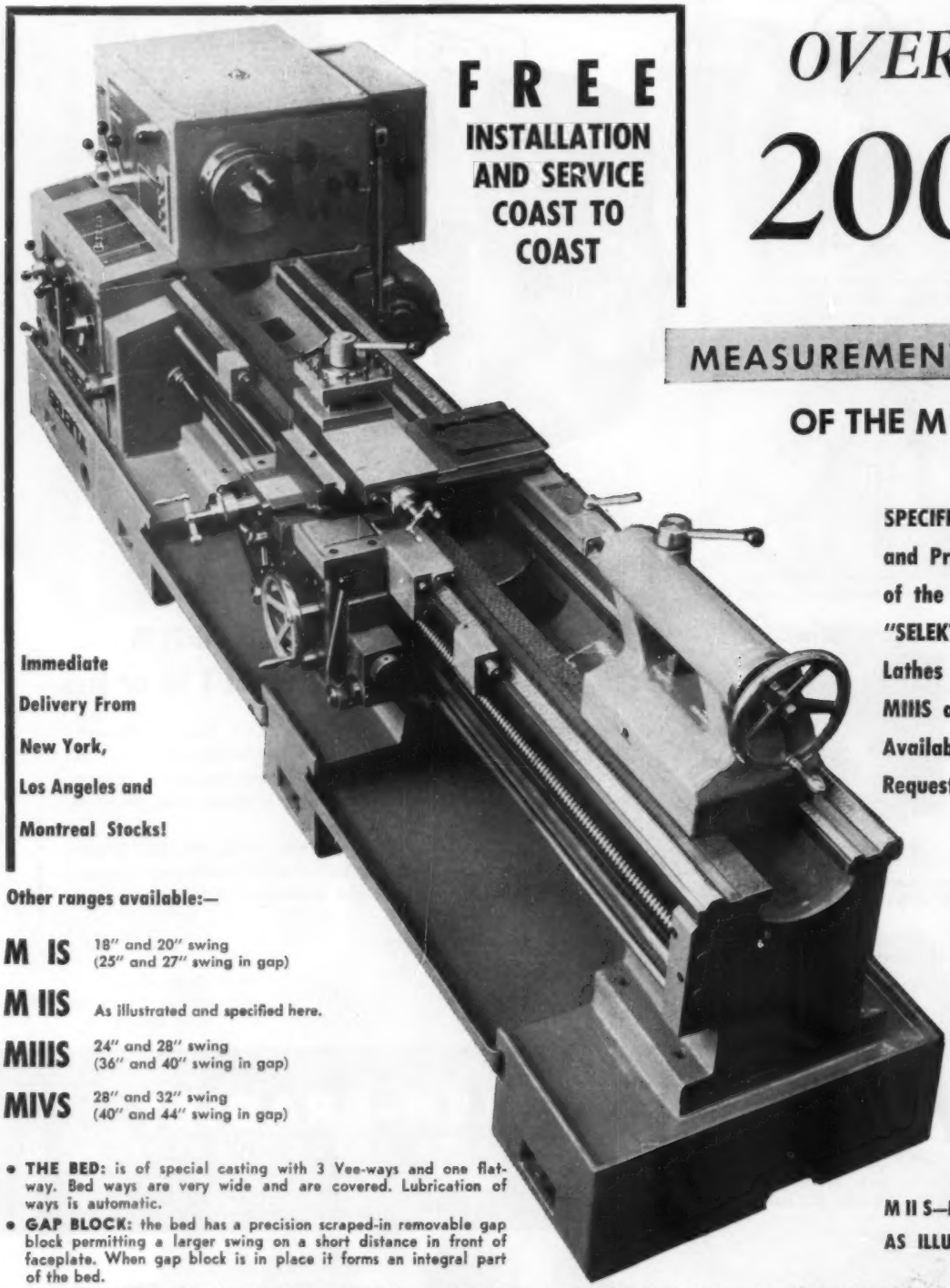
SOLENOID MOTOR CONTROL
QUALITY



Bulletin 600 starting switches fit into standard conduit boxes. They can be supplied in general-purpose, watertight, and explosion-proof enclosures for every service.

FREE
INSTALLATION AND SERVICE COAST TO COAST

OVER
200
MEASUREMENTS
OF THE M II S



SPECIFICATIONS and Prices of the "SELEKTA" Lathes MIS, MIIIS and MIVS Available on Request!

Immediate Delivery From New York, Los Angeles and Montreal Stocks!

Other ranges available:—

M IS 18" and 20" swing (25" and 27" swing in gap)

M IIS As illustrated and specified here.

MIIIS 24" and 28" swing (36" and 40" swing in gap)

MIVS 28" and 32" swing (40" and 44" swing in gap)

M II S—MODEL AS ILLUSTRATED

- **THE BED:** is of special casting with 3 Vee-ways and one flat-way. Bed ways are very wide and are covered. Lubrication of ways is automatic.
- **GAP BLOCK:** the bed has a precision scraped-in removable gap block permitting a larger swing on a short distance in front of faceplate. When gap block is in place it forms an integral part of the bed.
- **THE HEADSTOCK:** Hardened and ground spindle with large bore. Hardened and ground gears throughout. Spindle on highest precision roller bearings. Double friction clutch and brake on both directions of main spindle. Spindle is braked automatically after engagement of clutch. Automatic lubrication.
- **THE CARRIAGE:** Automatic disengagement of longitudinal and cross feeds in all directions by means of micrometric carriage stops adjustable in .001". Automatic cross and top slide adjustment. Reversing gear for forward and reverse. Feed adjustment wheel. Automatic lubrication.
- **CROSS AND TOP SLIDES:** Long guides — adjustable gibs — Top slide swivels 2 × 180°. Cross slide is extended to the whole width of bed.
- **ELECTRIC EQUIPMENT:** Time-limit push-button control, jogging (inching) switch lever on headstock. Start and stop lever on carriage. All reversing.

ALL DIALS GRADUATED IN .0005" ENABLING DIRECT SETTING OF .001" ON DIAMETER

BARER-MEUSER "SELEKTA" LATHES ALREADY INSTALLED IN THE U. S.!

Swing over bed	20"	22"
Swing over cross slide (with normal long cross slide)	12"	14"
Swing over cross slide (with special short cross slide)	14½"	16½"
Swing in gap (when gap block removed)	31"	33"
Width of bed	15"	15"
Width of gap	15"	15"
Width of gap in front of faceplate	10"	10"
Hole in spindle	2⅝"	2⅝"
Taper in tailstock	MT 5	MT 5

Lead screw having 2 Acme threads per inch.
40" and 60" centers, 2 cabinet legs; 80" and 100", 3 cabinet legs; 120 and 160", 4 cabinet legs; 200", 5 cabinet legs.

Automatic lubrication to headstock, quick change gear box and apron.
Automatic lubrication to bed ways by separate pump.

- **18 SPINDLE SPEEDS in 3 ranges**

  18—900 r.p.m., or 25—1250 r.p.m., or
  32—1600 r.p.m.

- **THREADING RANGE**

  (Without change gears):

  99 American threads from ¼ to 152 t.p.i.
  82 Metric threads from 0.5 to 288 mm.
  88 Diametral pitch threads from ½ to 192 t.p.n.i.
  52 Module threads from 0.25 to 42 module

- **FEED RANGE:**

Normal feeds:	
58 longitudinal feeds	.0006 — .054"
58 cross feeds	.00016 — .013"
Coarse feeds I:	
58 longitudinal feeds	.0024 — .214"
58 cross feeds	.0006 — .054"
Coarse feeds II:	
58 longitudinal feeds	.0094 — .850"
58 cross feeds	.0024 — .214"

STANDARD ACCESSORIES

(Included in price of machine):

15 HP motor 220-440/60/3 or 550/60/3 including time-limit push-button switches, jogging switch lever, and start and stop lever on carriage; all both forward and reverse.

1 Center sleeve	2 Micrometric stops for longitudinal feeds	
1 Driving plate	2 Micrometric stops for cross feeds	
1 American toolpost	1 Set of Spanners	Covered Ways
2 Centers	1 Set of Hook Spanners	Oil Pan

EXTRA ACCESSORIES (OPTIONAL)

20" or 22" Universal 4-jaw Independent Chuck fitted	$ 360.00
12" 3-jaw self-centering Chuck fitted	200.00
Follow Rest (cap. ⅜"-5½")	120.00
Steady Rest (cap. ⅜"-7½")	150.00
6" x 6" Four-way Tool Holder with separate compound	125.00
Taper Turning Attachment 16° x 19" length	500.00
Threading Dial	55.00
Large Steady Rest (cap. 4" x 10½") with needle bearing points	200.00
Large Steady Rest (cap. 6" x 12½") with needle bearing points	$ 250.00
Live Center MT No. 5	60.00
Coolant Pump with piping	250.00
Working-place Lamp	35.00
Collet Attachment	200.00
Collets ⅛"—2" raising by 1/16" each	16.00
Hydraulic tracing attachment with guaranteed accuracy of plus/minus .0002" between template and work-piece	2,800.00

PRICES are freight prepaid customer's plant anywhere in the U.S.A.

20" SWING (31" SWING IN GAP)

Swing	Centers	Weight	Price
20"	40"	lbs 9600	$ 9,200.00
20"	60"	lbs 10600	$ 9,500.00
20"	80"	lbs 11400	$ 9,900.00
20"	100"	lbs 12400	$10,350.00
20"	120"	lbs 13200	$10,800.00
20"	140"	lbs 14100	$11,250.00
20"	160"	lbs 15200	$11,750.00
20"	200"	lbs 16100	$12,500.00

22" SWING (33" SWING IN GAP)

Swing	Centers	Weight	Price
22"	40"	lbs 10200	$ 9,750.00
22"	60"	lbs 11200	$10,000.00
22"	80"	lbs 12000	$10,350.00
22"	100"	lbs 13000	$10,900.00
22"	120"	lbs 13800	$11,400.00
22"	140"	lbs 15200	$11,850.00
22"	160"	lbs 15700	$12,300.00
22"	200"	lbs 16600	$12,700.00

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No. P-2408

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Unobstructed perimeter (work from any side!)

Six Wheel Models

Capacities to 5,000 pounds.

3 table surfaces
4 point support

Four Wheel Models

Special Designs too!

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Just Imagine This . . .

You prepare an operation sheet to manufacture a complicated part. Instead of giving that sheet to a group of operators to make the part, you place the sheet into a controller, or a director, and push a button. The controller sets a machine tool in motion, and interprets the operation sheet's instructions to machine the part completely *without human help.*

Impossible? Farfetched? Not quite! It's already been done, and successfully, with Numerical Control. And the maintenance problem is negligible. At M.I.T., for example, a prototype milling machine "director" operated for 8,000 hours with only 3% down-time.

Twenty-four pages of step-by-step facts and pictures on how Numerical Control has been proved practical by extensive study and use are available to you in our special report, "Numerical Control — What It Means to Metalworking." The report tells you what Numerical Control is . . . why it will be used more . . . how numbers control . . . what computers contribute . . . and the 13 plus advantages of using this system. You'll especially want to read the pages that explain why firms *both large and small* will be able to afford Numerical Control.

To get the inside story of today's machine-tool control for tomorrow, write for your copy of this report now. 35¢ each.

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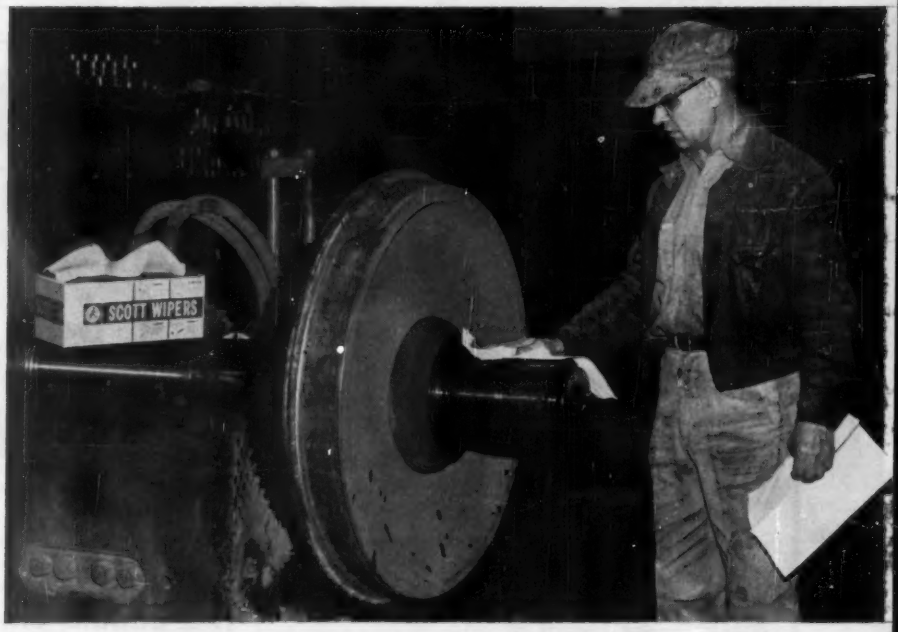

Scott Wipers really help remove the dirt from these big axles, preparatory to regreasing, at the Lindenwood shops of the Frisco Railway. Scott Wipers are 2-ply paper, chemically treated and then "perf-embossed." This exclusive process* creates angled surfaces which provide thorough cleansing action and speed absorption of oil and grease.

WIPER PROBLEM? Look what Frisco did with Scott Wipers!

The St. Louis–San Francisco Railway Company—widely known as Frisco—was concerned with the safety hazards, the high costs and other unsatisfactory features in its use of cloth wipers. The switch to Scott Wipers two years ago solved many of these problems.

Scott Wipers are used throughout Frisco's Lindenwood shops at St. Louis and its shops at Springfield, Missouri, where the big diesels are overhauled and serviced. Formerly, workers frequently used cloth wipers beyond their saturation point—"wiping on as much dirt as they wiped off." Now Scott Wipers are discarded as soon as they've wiped the dirt and grease away. When workers wipe their hands, they like the cleanliness and sanitation of Scott Wipers—and when used fresh from their "pop-up" box, there are no hidden pieces of metal which might cut or scratch. And Scott Wipers save time and money with their low unit cost as compared with the purchase, handling and laundering of cloth wipers.

Scott Wipers are being used for a wide variety of industrial wiping operations, including many involving solvents. Want more details? Just call your local Scott representative or distributor. Or write Scott Paper Company, Department AM-74, Chester, Pennsylvania.

SCOTT PAPER COMPANY

Makers of the famous Scott paper products you use in your home.
Consult your local TV schedules for Scott's program, "Father Knows Best."

*Patent pending

that "NEEDED LIFT" can come from EUCLID CRANES & HOISTS TO "RAISE PROFITS"

You name the job or jobs to be done! We'll supply a crane or cranes that will do it. Standard Models in a wide range of styles, sizes and capacities will generally meet your requirements. If not, we'll engineer and build what you need. We've been doing it for more than 40 years.

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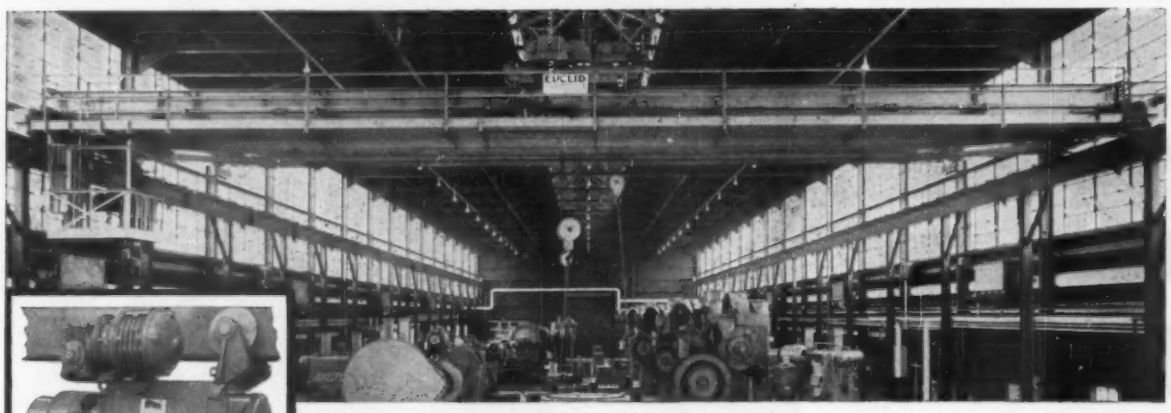

In Capacities from 2000 to 50,000 lbs.

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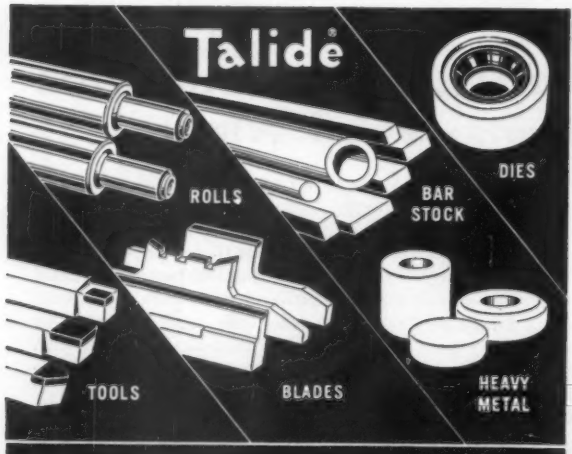

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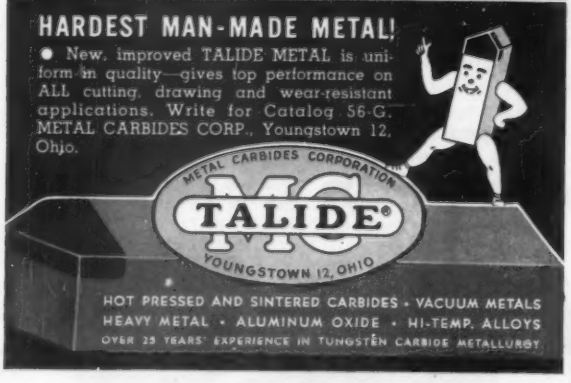
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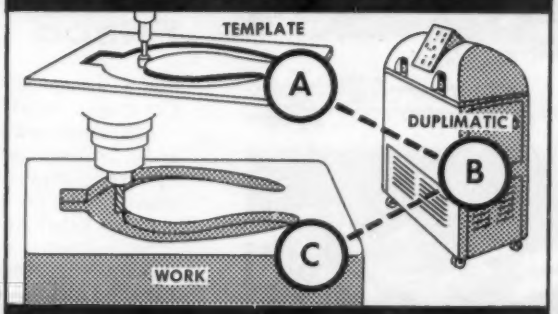

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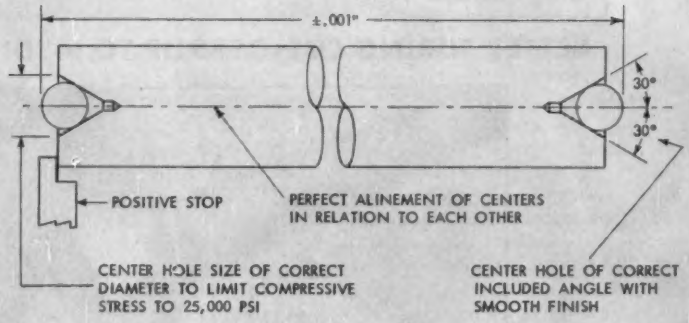
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PERFECT ALINEMENT OF CENTERS IN RELATION TO EACH OTHER
CENTER HOLE SIZE OF CORRECT DIAMETER TO LIMIT COMPRESSIVE STRESS TO 25,000 PSI
CENTER HOLE OF CORRECT INCLUDED ANGLE WITH SMOOTH FINISH

The above sketch graphically highlights the centering "musts" for work to be automatically machined between centers.

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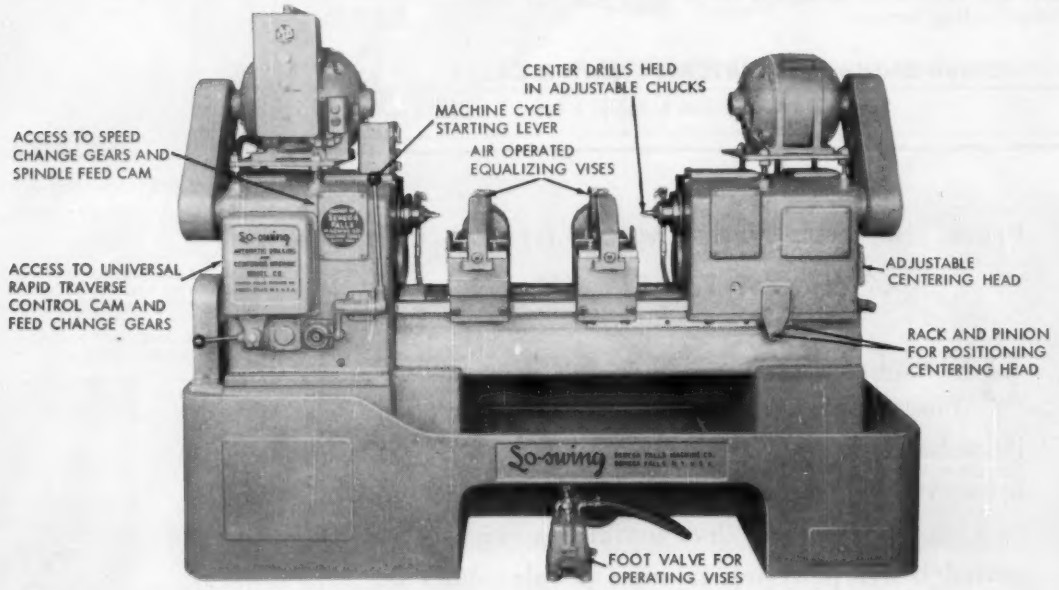
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Lo-swing
FOOT VALVE FOR OPERATING VISES

Lo-swing MODEL CS AUTOMATIC CENTERING MACHINE

Allison
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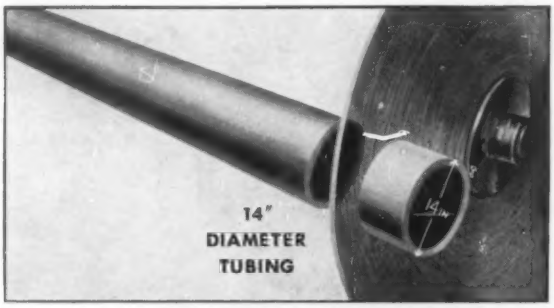

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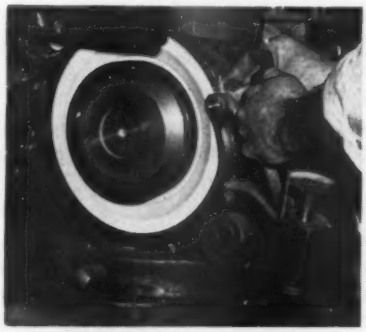
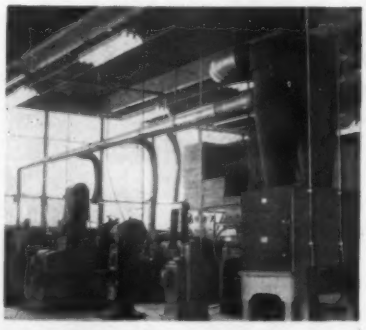
problem: stop dust from causing health and morale problems.



problem: prevent dust from damaging costly precision machines.



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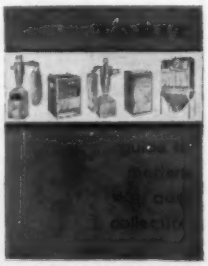

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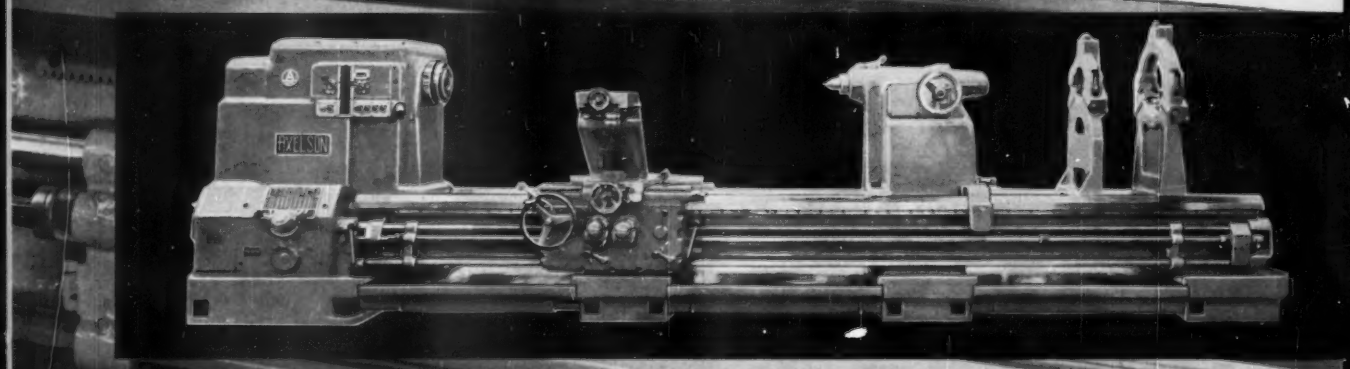

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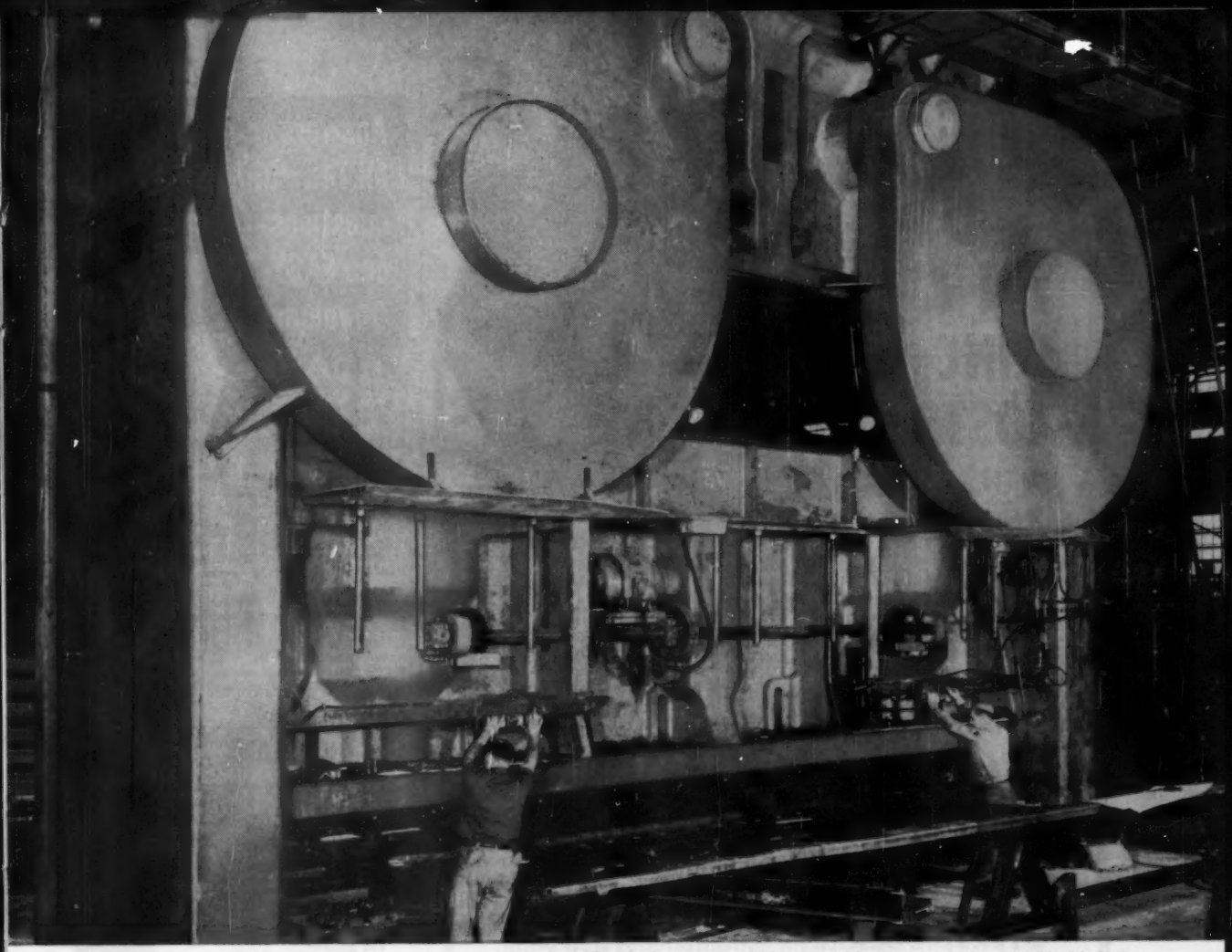

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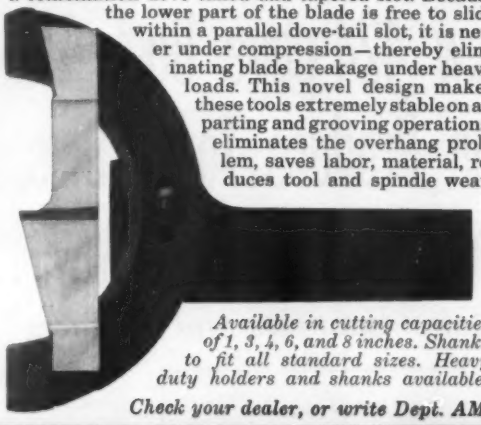

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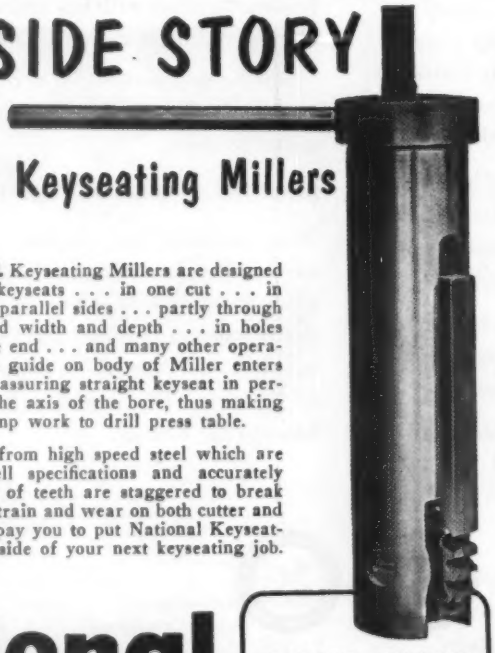
The INSIDE STORY about NATIONAL Keyseating Millers



NATIONAL Keyseating Millers are designed for milling internal keyseats . . . in one cut . . . in offset holes . . . with parallel sides . . . partly through holes . . . of standard width and depth . . . in holes that are closed at one end . . . and many other operations. A demountable guide on body of Miller enters keyseat being milled assuring straight keyseat in perfect alignment with the axis of the bore, thus making it unnecessary to clamp work to drill press table.

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the Surplus Machinery Market

From the West Coast comes word that business showed a steady pickup all through March and into April after a beginning-of-the-year tax period lull. Reason for the lull was the reluctance of calendar-year taxpaying companies to do any heavy machine tool buying before they saw how big a bite the government would take out of their operating money. Most affected by tax worries were the smaller purchasers. But now, several major West Coast used machinery dealers report the sales picture is "bright," and expect it to stay that way all summer.

Supply of available used machinery is plentiful on the West Coast now—if the price is right. And several major dealers report installment buying is increasing markedly.

Western machinery dealers, particularly those in the Los Angeles area, report that increased government aircraft contracts have given the used machinery business a shot in the arm.

But, they say, increased production of guided missiles hasn't yet had much effect on used tool sales. It's expected that the guided missile people will eventually do some fairly heavy buying—but it will be spread out gradually over the next three to five years. Guided missile demand, most West Coasters think, will be for small used machines rather than for special equipment. That's because most of the big special stuff was originally built for purposes alien to missile production.

Price increases and some delays in delivery of new machines have aided West Coast used machine sales substantially. Heaviest current demand is for ram-type turret lathes in particular and for late-model (less than 10 years old) lathes, milling machines and heavy-duty engine lathes in general.

An overall rise in prices of used machines, following the lead of new machines, is anticipated by California dealers, who fear they'll have to re-educate buyers to the new prices.

Elsewhere in the country, the used machinery market has had a healthier tone to it since the advent of spring, with the exception of the Detroit area, where an erratic auto market is dimming the sales picture. Particularly "hot" as market areas right now are the Southeast and Southwest, where small firms that lack the capital to start out with all new machine tools are buying up used ones. Inquiries are increasing all across the country, and business coast-to-coast is running even with, or slightly ahead, of last year.

Don't know whether or not you saw the March 19 *Journal of Commerce*, in which it's reported that Strom Machinery Co of Hammond, Ind, has been doing a land-office business in exporting used heavy presses to other dealers and to manufacturers in France, Sweden, Spain, Ireland, Mexico, and Brazil. We carried a photo ("Heaviest Single Machinery Shipment?" on p 167, AM April 8 issue) showing three freight cars carrying a huge (750,000 lbs) steam drop-forge hammer to the Port of New Orleans for shipment to a French maker of auto forgings. It's also reported by the *Journal of Commerce* that buyers for accounts in Great Britain have been active in the Chicago market.

Support of Senate Bill S351, the one introduced by Senator John Sparkman of the Senate Small Business Committee, is being urged by the Machinery Dealers' National Association. S351 is the bill that recommends the same tax writeoff privileges for purchasers of used machinery as for new machines.

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B & S 00G Screw Threader—Vert. Slide—1950
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BULLARD 36" Spiral Drive, 3-Jaw Chuck Table, Vert.
BULLARD 42" Spiral Drive, 4-Jaw Chuck Table, Vert.
DEFIANCE #5 3" Horizontal

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FELLOWS #61A Spur Gear Shaver

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DoALL D6 6 x 18 Hor. Hydr.—Selectron—Coolant—1953
NORTON 6 x 18 Hor. Hydr.
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AMERICAN 36" x 80" High Duty 12-Speed
PRATT & WHITNEY Model C 14 x 30 16-Speed
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P & W M-1482 30" 2-Spdl. Vert.

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B & O #7 2½" Ram—Bar or Chucker
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GISHOLT #4 2" Ram—Chucker
GISHOLT #5 2½" Ram—Bar or Chucker
GISHOLT #2L 3½" Saddle — Taper — Threading
W & S #2 1" Ram—El. Bar Feed
W & S #3 1½" Ram—Chucker
W & S #5 2½" Ram—Bar—Presselect.

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B & S #2 Light Type Plain
B & S 3B Standard Plain—Vert. Attach.
VAN NORMAN #22L Plain

PRODUCTION MILLERS
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CINC. #08 R & F—1951
CINC. #2-24 Plain
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4 DE POTTER & JOHNSTON Automatic Turret Lathe, Late Type.

24", 36" BULLARD Vertical Turret Lathe, Turret Hd., Side Hd., M.D.

No. 2, 3, 4, 6 WARNER & SWASEY Univ. Turret Lathes, Bar Feed.

No. 3, No. 7 BARDONS & OLIVER Universal Turret Lathes, Preselector. Bar & Chucking. Late

17" x 8' LeBlond Regal Grd. Hd. Lathe, M.D.

No. 1L, 2L, 3L GISHOLT Univ. Turret Lathe, Cross Sliding Turret, M.D.

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28" BARNES Upright Drill Press No. 242 M.D. Box Column, Power Feed.

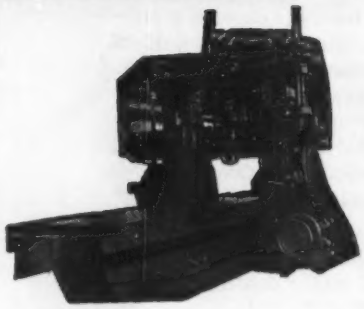
3', 5', 6' CINCINNATI BICKFORD Radial.

No. 2 M. T. Six Spindle ALLEN Type KH Drill Press. Individual Motor Drive. Late Type.

MILLS

No. 0-8, 1-1, 1-18 CINCINNATI Horizontal & Vertical Prod. Mills, M.D.

6 Spindle LELAND GIFFORD No. 2LMS-20" Drill Press. Excellent Condition.



No. 2HL KEARNEY & TRECKER Horiz. Mill, M.D., Late Type.

42" x 36" x 12' INGERSOLL Planer Type Mill, two heads on rail, two side heads, M.D.

No. 2 BROWN & SHARPE Vert. Mill, Light Type. Swivel Head, M.D. Late

48" CINCINNATI Duplex Automatic Prod. Mill. M.D.

No. 2, 3, 4, 5 CINCINNATI Hi Power Horiz. Mills, M.D. Rect. Overarms.

No. 2, No. 3 CINCINNATI HSDT Horiz. Mills, Vert. Heads Extra Table Travel, 1945.

No. 1-14 KENT-OWENS Hydraulic Prod. Mills M.D., Late Type.

No. 4 CINCINNATI Hi Power Vert. Mill, 1942.

PRESSES

No. 6 BLISS Straight Side Press Double Crank 135 Tons Cap., Motor Driven.

400 Tons CHAMBERSBURG Hydraulic Wheel Press, 14" Ram, 96" between Tie Bars, 12' to End Support, M.D.

3W WATERBURY FARREL Hi-Speed Blanking, 60 Tons Cap., 1½" Stroke, Reeves Drive.

GRINDERS

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6" x 18" LANDIS Type "C" M.D. Hyd., Cylindrical Grinder, Serial #29196.

MISCELLANEOUS

18 KW SCIENTIFIC ELECTRIC Induction Heater, Tube Type.

36" x 36" x 8' CLEVELAND Openside Planer, 1 Swivel Head on Rail, 1 Swivel Side Head.

No. 175 SCHMIDT M.D. Hyd. Power Marking Machine, Late Type.

No. 6 BROWN & SHARPE Automatic Screw Machine, M.D., 2" Capacity.

No. 194 BARNES Vertical Hone, 4" Capacity, 12" Stroke, M.D.

12" PRATT & WHITNEY Vertical Shaper, Keller Attachment. Late Type.

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Cincinnati No. 5 Rect. Overarm Grd. Hd. Plain Horiz. Miller.
Baush 44" Vert. Boring Mill 2 heads.
American Vert. Hyd. Broach 48" str. 15 ton cap. 1947
American 20"x8' Grd. Hd. Lathe motor in base.
Landis 20"x22" and 18"x90" Plain xt. Grinder.
Hanchett 25 H.P. Sp. Vert. Hydr. Surf. Grinder 12"x48" table
W&S No. 2-A Grd. Hd. Univ. Turret Lathe
Bliss 200 T Cap. S.S.S.C.B. Grd Press 8" Str. #77
Rivett No. 104 A.C. M.D. Internal Grinder. 1942.
Milwaukee Nos. 2-B & 3-B Horiz. Plain Millers.
Cincinnati 30"x36"x10" D.H. Planer 2 Hds. Box
Amer. 6' Radial Encl. Hd. 10" Col. 32-Sp. Speeds.
Amer. 4 Radial 12" Col. Encl. Hd.
Bliss #6N BG. Stiles Type Press
Cincinnati No. 2 Hi-Power S.P.D. Vert. Miller.
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Barnes 20" All Grd. Camel Back Drill 1-Sp.
Blanchard M.D. Vert. Sp. Surf. Grinder 26" chuck.
Sundstrand 4-Sp. Vert. Rigidmill.
Heald #22 Rot. Surf. Grinder 12" chuck 1942.
Landis 2-Sp. 2" Cap. Bolt Threader M.D.
Handey 16"x8' bed Q.C.G. Lathe 1939.
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Newton 48" Table 1-Sp. Cent. Vert. Miller.
Foster 2-F Fastermatic Hyd. Turret Lathe.
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P & J #2 Auto. Pred. Miller, 2 Tables.

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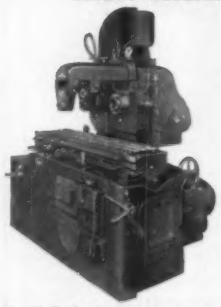

45 - 48 Cincinnati Tracer Controlled Hydromatic Mill, late type; table travel 48"; power rapid traverse to table.

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CINN 5-60 Prod. Mill 1944
K&T 1404 Prod. Mill 1943
CINN. 1-13 Prod. Mill 1951
SUNDSTRAND #1 Rigidmill 1954
TOCCO 200 KW, 3,000 cy. 1943
TOCCO 200 KW, 10,000 cy. 1943
GISHOLT #3 Air Chuck & Cyl. 1943
WARNER & SWASEY 2A Bar Feed 1948
"3" AJAX Air Clutch Upsetter, 1947
BULLARD 42", VTL Side Head
LAPOINTE, Vert. Broach 20T, 90" st. 1941
CINN. Cyl. Grinder 6x18 Plunge 1945
CINN. Cyl. Grinder, 10x18 Plunge 1941
CINN. Cyl. Grinder, 18x72 Plunge 1943
CINN. #2 Centreless; Grinder Flimatic 944
EXCELLO #33 Thread Grinder 1942
NORTON Cyl. Grinder, 6x18 Plunge 1944
HANCHETT #900 Face Grinder 1944
ROCKFORD Hyd. Vert. Shaper, 12" st. 1944
GRAY DH Planer, 60x60x12, 4 heads, DC drive
BETTS DH Planer, 84x84x16, 4 heads, DC drive
SOMMER & ADAMS Thread Mill, 18", H.I.S. 1943
BIGNALL & KEELER 6" pipe threader. 1949
BIGNALL & KEELER 12" pipe threader. 1949
BIRDSBORO hydraulic straightening press, 600 ton, 60x72 bed, 18"stroke, 36" daylight (3) 1942

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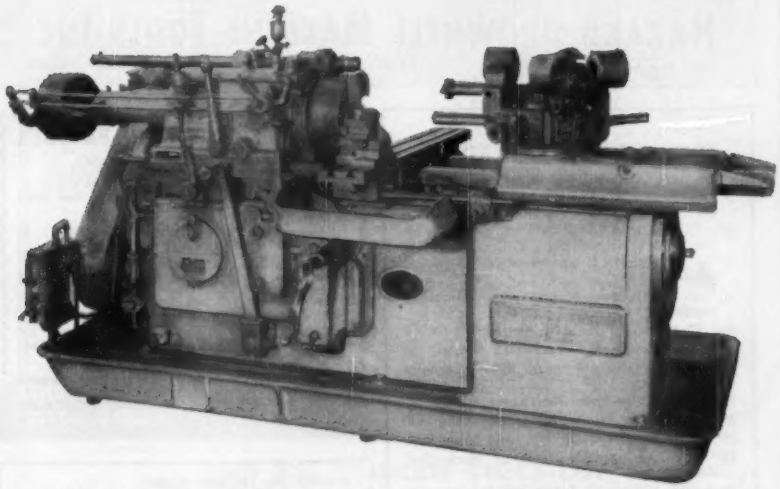

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BULLARD 16", 6 spindle, Type D "Mult-au-Matic"; late type.
BULLARD 24" Vertical Turret Lathe, spiral drive; late type.
BULLARD 36" Vertical Turret Lathe; spiral drive, with standard or extra high column; late type.
BULLARD 30" x 20" Man-Au-Trol Spacer Unit.
CINCINNATI 42", 2 swivel heads; adj. rail, M.D.; late type.
KING 36" heavy duty Vertical Turret Lathe.

BORING MILLS—HORIZONTAL

DETRICK & HARVEY 4" bar, floor type; M.D.
GIDDINGS & LEWIS #340T, 4" bar, table type; auto. positioning for head and table. New 1953.
HEALD #46B "Borematic", single end, single spindle; late type.
HEALD #49 "Borematic", double end, 4 spindle; late type.
LANDIS #35 floor type, 3½" bar; motor drive.
LUCAS #43 "Precision"; 4½" bar; table type with 72"x72" table, 20' to outboard support; late type.
NILES BEMENT POND 3½" bar, portable, floor type.
SELLERS 4" table type, horizontal Boring, Milling & Drilling Machine; late type.

GEAR EQUIPMENT—FELLOWS

FELLOWS #13-LS Gear Lapping Machine; late type.
FELLOWS #3, fine pitch; late type.
FELLOWS Type 6Z2 Gear Shaper; high speed; cap. 35" O.D., 4 D.P.
FELLOWS No. 6IA Gear Shaper; 18" O.D., ¾ D.P., late type.
FELLOWS No. 6I2 Gear Shaper; 35" O.D., ¾ D.P.; late type.
FELLOWS #6458A3 Gear Shaper; 18" O.D.; late type.
FELLOWS #7 High Speed Gear Shaper; cap. 7" O.D., 6 D.P.; New 1951.
FELLOWS #7A High Speed Gear Shaper; 7" O.D., 6 D.P.; late type.
FELLOWS #72 High Speed Gear Shaper; 6 D.P.
FELLOWS #75 High Speed Gear Shaper; 7" O.D., 6/8 D.P.; late type.
FELLOWS #77 High Speed Gear Shaper; 8" O.D., 8/10 D.P., helical; late type
FELLOWS #715 High Speed Gear Shaper, 7" O.D., 6 D.P., late type.
FELLOWS #12M Involute Measuring Instrument; late type.
FELLOWS #24M Involute Measuring Instrument; late type.
FELLOWS #4T Thread Generator; cap. 4"x18" centers; 5 D.P.; late type.
FELLOWS #624 Gear Shaper; 4 D.P.; late type.

GEAR EQUIPMENT—GLEASON

GLEASON #1 Surface Hardener late type.
GLEASON 3" Straight Bevel Gear Generator; 4-7/16" P.D., 8 D.P.; late type.
GLEASON 3" Spiral Bevel Gear Generator; 4-7/16" P.D., 12 D.P.; late type.
GLEASON #6 Straight Bevel "Revacycle", .450 D.P.; late type.
GLEASON #7 Hypoid Cutter Sharpener; late type; max. dia. 6" R or L hand.
GLEASON 11" Straight Bevel Gear Generator; M.D.
GLEASON #12 Tool Sharpener; late type.
GLEASON 12" Spiral Bevel Cutter Sharpener; max. dia. 15", m.d.
GLEASON #12 Straight Bevel Gear Rougher; 4 D.P.; late type.
GLEASON 12" Straight Bevel Gear Generator Roughing & Finishing, 3 D.P.; late type.
GLEASON #14 Hypoid & Spiral Bevel Gear Grinder; max. dia. 16"; late type.
GLEASON #16 Hypoid & Spiral Bevel Gear Generator; 2½ D.P.; late type.
GLEASON #12B Straight Bevel "Coniflex Type" Gear Generator; 3 D.P.; max. dia. 24"; late type.
GLEASON 15" Spiral Cutter Grinder; M.D.
GLEASON 15" Spiral Bevel Gear Generator; max. dia. 19¾", 3 D.P.; M.D.
GLEASON 18" Straight Bevel Gear Generator; 3 D.P.; max. dia. 20"; M.D.
GLEASON 25" Spiral Bevel Gear Generator; max. dia. 34"; 1½ D.P.; M.D.
GLEASON 25" Straight Bevel Gear Generator; max. dia. 35¼"; 1½ D.P.; late type.

GEAR EQUIPMENT—GLEASON—Continued

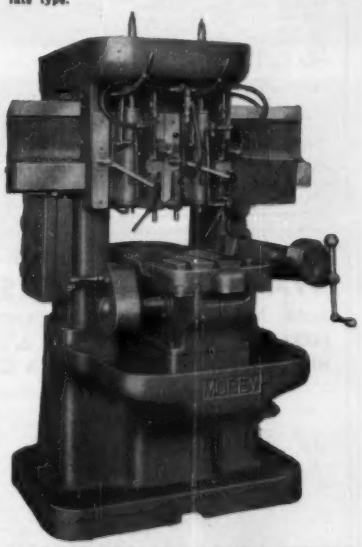
GLEASON 24" Straight Bevel Gear Planer; max. dia. 28"; 1½ D.P.; M.D.
GLEASON 37" Spur & Straight Bevel Gear Planer; max. dia. 48"; 1 D.P.; M.D.
GLEASON 54" Spur and Straight Bevel Gear Planer; max. dia. 60"; 3½" D.P.; M.D.

GEAR EQUIPMENT: HOBBING

BARBER COLMAN #3 Gear Hobbing, "Precision"; cap. 5", 12 D.P.; late type.
BARBER COLMAN Type A; cap. 12"x12"; 3 D.P.; late type.
BARBER COLMAN Type T, 12"x12" cap., 3 D.P.; late type.
BARBER COLMAN #17, cap. 8", 2½ D.P., 5¾" hole thru spindle; M.D.
GOULD & EBERHARDT #8H Universal; cap. 12"; 4 D.P.; M.D.
GOULD & EBERHARDT #12H Universal; cap. 12"; 4 D.P.; M.D.
GOULD & EBERHARDT Model 24-H Universal, 27" cap., 3½ D.P.; late type.
GOULD & EBERHARDT #24H Universal; extended hob spindle.
PFAUTER (SCHUCHARDT & SCHUTTE) #1 Univ.; M.D.
KOEPFER Model WM-11 Automatic Gear Cutter; 24 D.P.; late type.
BARBER COLMAN Type S Auto. Gear Hobbing Machine #1, 1" dia., brass 24 D.P., steel 32 D.P.; late type.

GEAR EQUIPMENT—MISCELLANEOUS

BILGRAM 6" Bevel Gear Generator; 1 D.P.; M.D.
BILGRAM 16" Bevel Gear Generator; 2 D.P.; M.D.
BROWN & SHARPE #13 Straight & Bevel Auto. Gear Cutter; 18" cap., 4 D.P.; M.D.
CINCINNATI #4 Auto. Gear Cutter; cap. 36"; 2½ D.P.; late type.
CINCINNATI #6A Auto. Gear Cutter; cap. 72", 1½ D.P.; late type.
CROSS #1 Gear Tooth Rounding Machine; cap. 4 pitch or finer to 24" dia., 2 pitch or finer to 8" dia.
CROSS #40 Gear Tooth Pointing & Chamfering Machine; gear face 10"; gear dia. 20"; gear pitch 2 or finer.
CROSS #45 Gear Chamfering Machine; late type.
DETROIT Type GG-35 Gear Grinder; late type.
GOULD & EBERHARDT #36BM; 3 spindle Gear Rougher; 2 D.P., M.D.
GOULD & EBERHARDT #36BT Gear Rougher; 4 D.P., M.D.
MICHIGAN Model 862-24A Gear Finishing Machine; late type.
MICHIGAN Model 834 Rack Type Gear Shaver; 8" dia., 2" face; M.D.
PRATT & WHITNEY 10" Gear Grinder; single wheel type; cap. 10-11/16".
SHEFFIELD (Cimatool) #201A Auto. Burring Machine; late type.



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*2U Stokerunit Hydr Spl end. 1950

BROACH

*5-42 Cine Duplex, 15 HP 1950

CHUCKER

*#14 New Britain 6½" Hydr. chucks, 4 spdl.

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*W8 Baush Hydr w/o Head, Excel.

GRINDERS

*6x18 Parker Majestic Surface, Precision, '53
*16A2 Blanchard 2 spdl. Autom. Surf. '48
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#3 W&S Univ. Turret, 12 speed Ser #448293—'37
*#3 W&S Turret, Chucker #557550
*#10 Sundstr Autom Prod '43
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*3A W&S Turret C. Feed Turret Ser #526180
*4A W&S Turret, C. Feed Turret Ser #674080

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*2H K & T Vert., Micr. Stops, 5 HP, '42
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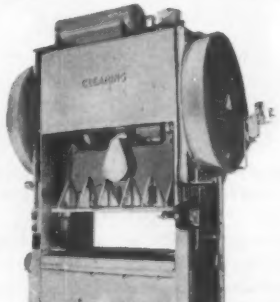

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R14 Seneca Falls, 16"x36", 1942
120"x96' ce N-B.-P. ser. 3380
#5W Cinn. Acme Univ. Turret
#4 Gisholt Univ. Tur. A.C.&B.F.
#3H-10 Libby H.D. Tur. 1942
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4FU Fastermatic, tur, 33" sw 1944
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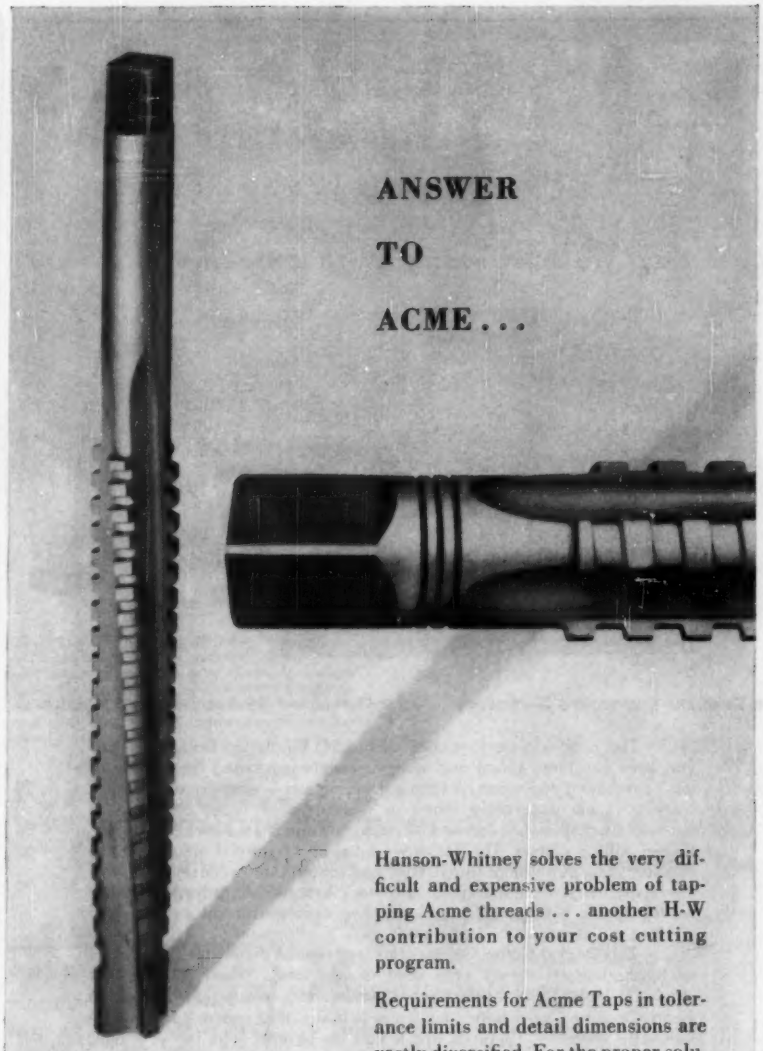

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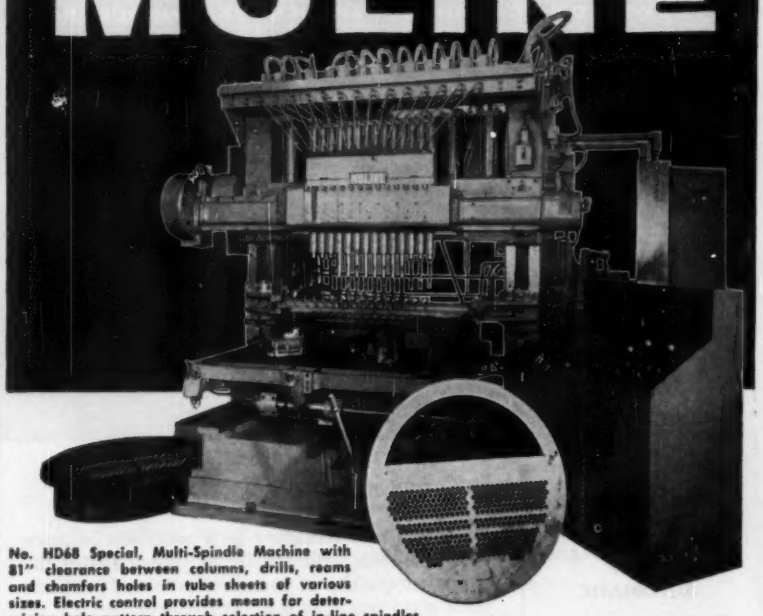

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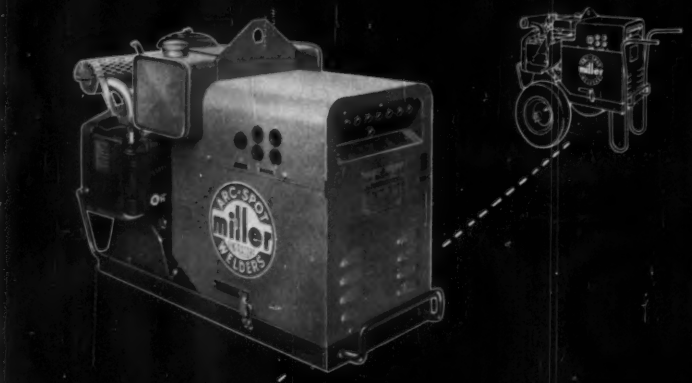

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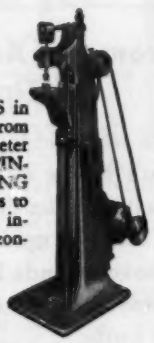

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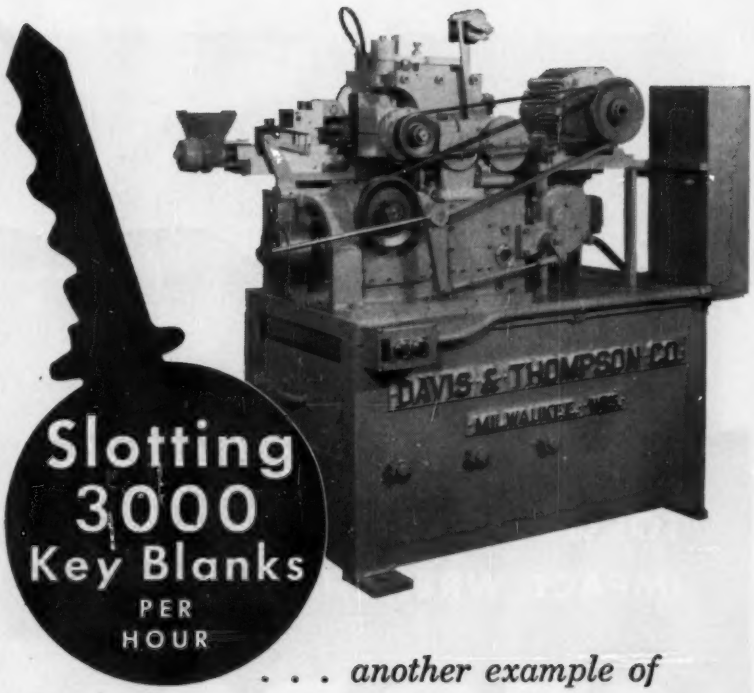

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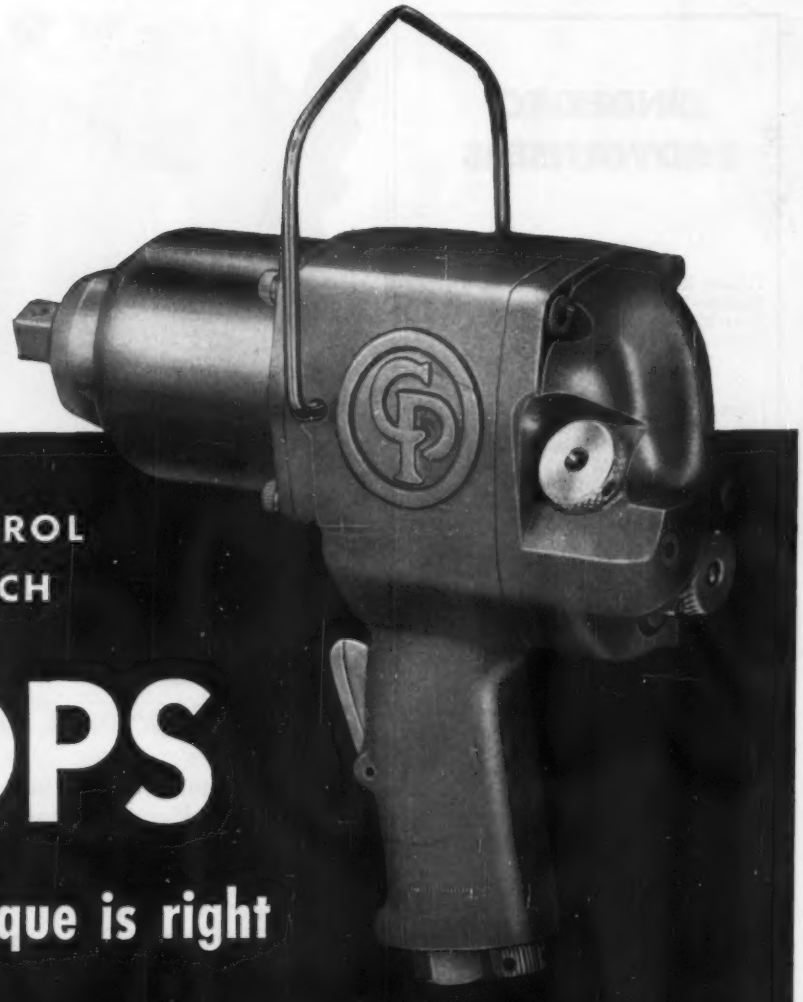

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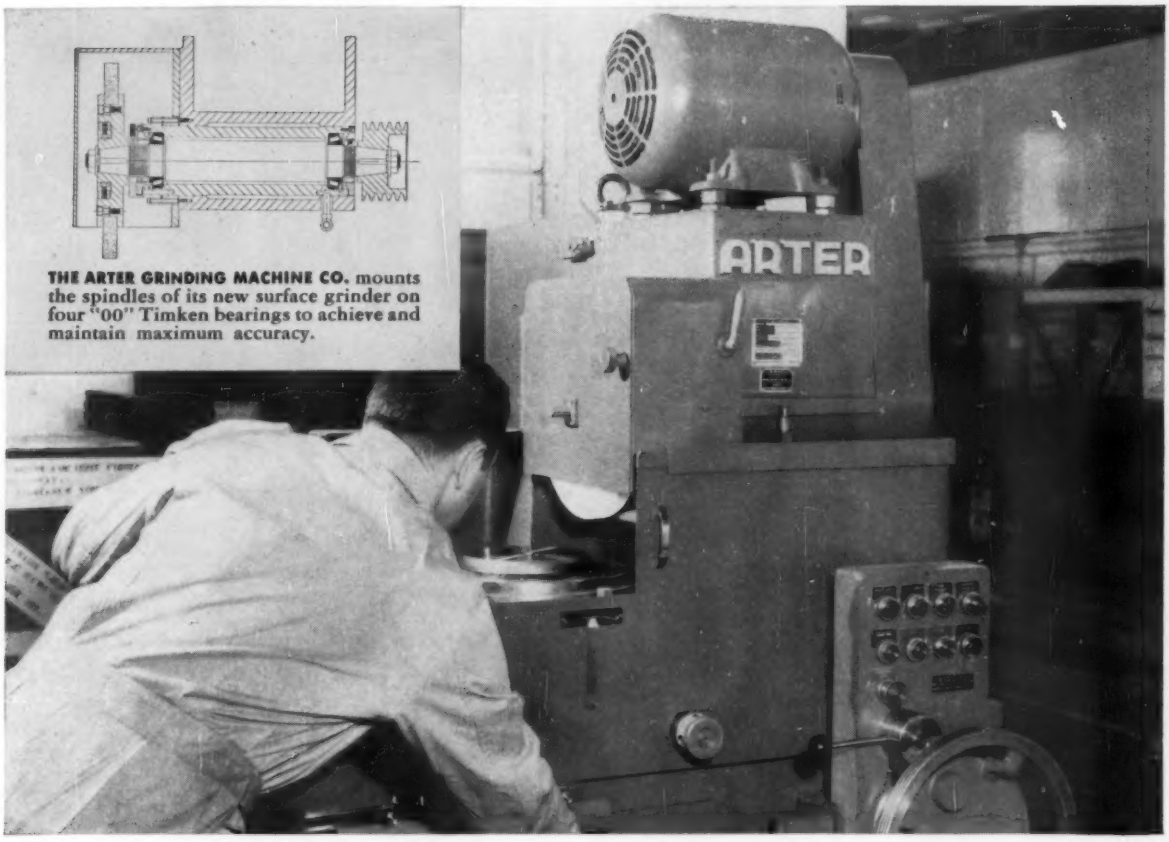


THE ARTER GRINDING MACHINE CO. mounts the spindles of its new surface grinder on four "00" Timken bearings to achieve and maintain maximum accuracy.

New precision grinder costs less to make, gives smoother spindle operation with TIMKEN® bearings

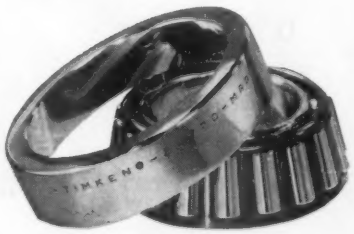
TO get the smooth spindle operation required for the extreme precision of their new surface grinder, The Arter Grinding Machine Company mounted the work spindle and the wheel spindle on four "00" Timken® tapered roller bearings. The extremely low run-out tolerances of Timken "00" bearings—75 millionths of an inch—make possible the closest machining tolerances ever achieved. And by using two Timken precision bearings on the spindle, Arter got greater capacity in less space—cut manufacturing costs ⅓ over earlier spindles used.

Timken "00" precision bearings not only deliver highest precision, but like all Timken bearings, they take both radial and thrust loads in any combination. And full line contact between Timken bearing rollers and races gives them extra load-carrying capacity. Shafts are held rigid — accuracy is maintained — gear life increased. Timken bearings run smoothly because they practically eliminate friction. They're designed by geometric law to have true rolling motion and precision manufactured to live up to their design. Normally last the life of a machine they're in.

The Timken Company developed "00" bearings to meet the demands of today's new precision machine tools. To produce these bearings, the Timken Company perfected measuring devices of unprecedented precision and developed new manufacturing techniques. The "00" bearing has achieved twice the precision of any previous Timken bearing.

Whatever machines you buy or build make sure your bearings are the best. Look for the trade-mark "Timken" on every bearing and be sure of maximum life, dependability, and minimum maintenance. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



TIMKEN TAPERED ROLLER BEARINGS ROLL THE LOAD

TRADE-MARK REG. U. S. PAT. OFF.